

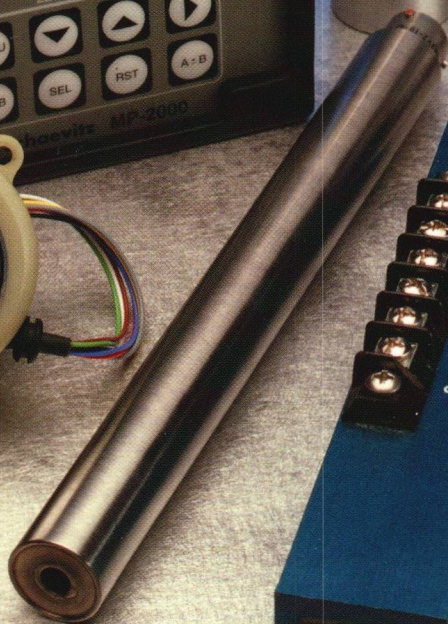
Schaevitz® Sensor Solutions

Continuing
Over 50 Years of
Innovative Sensor
Technology

Linear and Rotary Displacement

Tilt

Pressure • Fluid Level • Instrumentation



**SCHAEVITZ
SENSORS**

A Division of Measurement Specialties, Inc.

M
MEASUREMENT
SPECIALTIES

Schaevitz® Sensors

The Name in Sensor Technology

When you need a sensor for linear and rotary displacement, pressure, tilt, liquid level – there's an easy way to solve your problem. Schaevitz® Sensors.

Schaevitz® offers more...

... more sensor technologies
... more standard designs
... and more engineering
resources for your
specialized applications



Schaevitz® Sensors
A Division of Measurement
Specialties, Inc.

What better place to research your sensor technology requirements than with the company that originally commercialized LVDT technology? For decades, Schaevitz® Sensors has kept pace with industry's need for further enhancements of this important development, while adding significant sensor products for a diverse range of other measurement requirements.

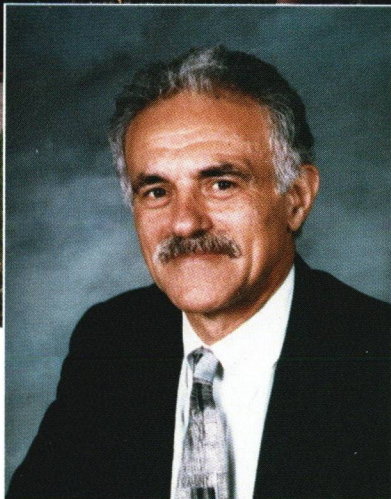
This in-depth experience and product breadth provides each of our customers with the significant advantage of product innovation tailored to your specific needs. We consistently utilize the widest range of advanced sensor technologies and manufacturing techniques to provide reliably accurate measurement, resolution and display of displacement, pressure, force, tilt, angle, and level.

The Schaevitz® high tech line of sensors, focussed primarily on high volume customer requirements, has been developed, designed, and manufactured at our state-of-the-art facilities in the U.S., Europe and Asia, offering your company the benefit of the highest quality at the most cost-effective price. One of our key goals is to help you make applications feasible that, without our experience and pricing, would otherwise be prohibitively expensive.

Each customer order of Schaevitz® sensor technology is supported by the industry's finest customer service group, combining years of training with global experience in sensor use and applications. Combined with our well-funded research & development, ISO 9001 certified manufacturing, and talented management, your experience with Schaevitz® Sensors will always be the best possible.

Dana Mund *Joseph R. Mallon Jr.*

Schaevitz® Sensors, Division of Measurement Specialties, Inc.



Damon Germanton
President and Chief Operations Officer
Measurement Specialties, Incorporated



Joseph R. Mallon, Jr.
Chairman and Chief Executive Officer
Measurement Specialties, Incorporated

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All product information and specifications subject to change without notice.

**SCHAEVITZ
SENSORS**

Schaevitz® Sensors

Experience



The Schaevitz® Sensors range of transducer products is built on a 50 year tradition of quality solutions for our customers' measurement needs. With the Schaevitz® team, you have the widest choice of proven sensors and support for linear and rotary position, pressure, slope/tilt, dimensional gaging, associated instrumentation and customized systems. We provide cost-effective solutions and application support experience that meet and exceed the quality and service expected by today's design engineers.



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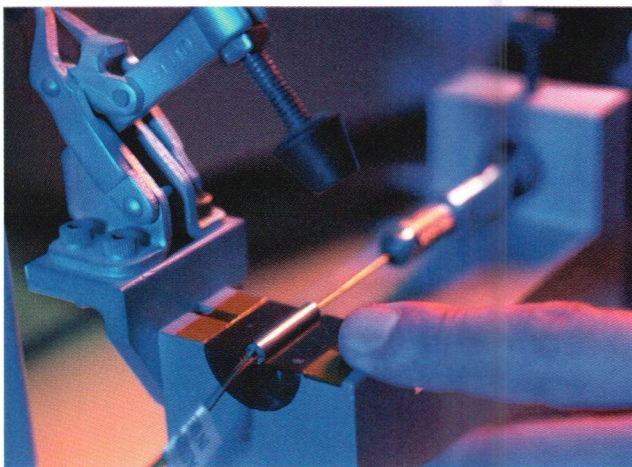
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Schaevitz® Sensors

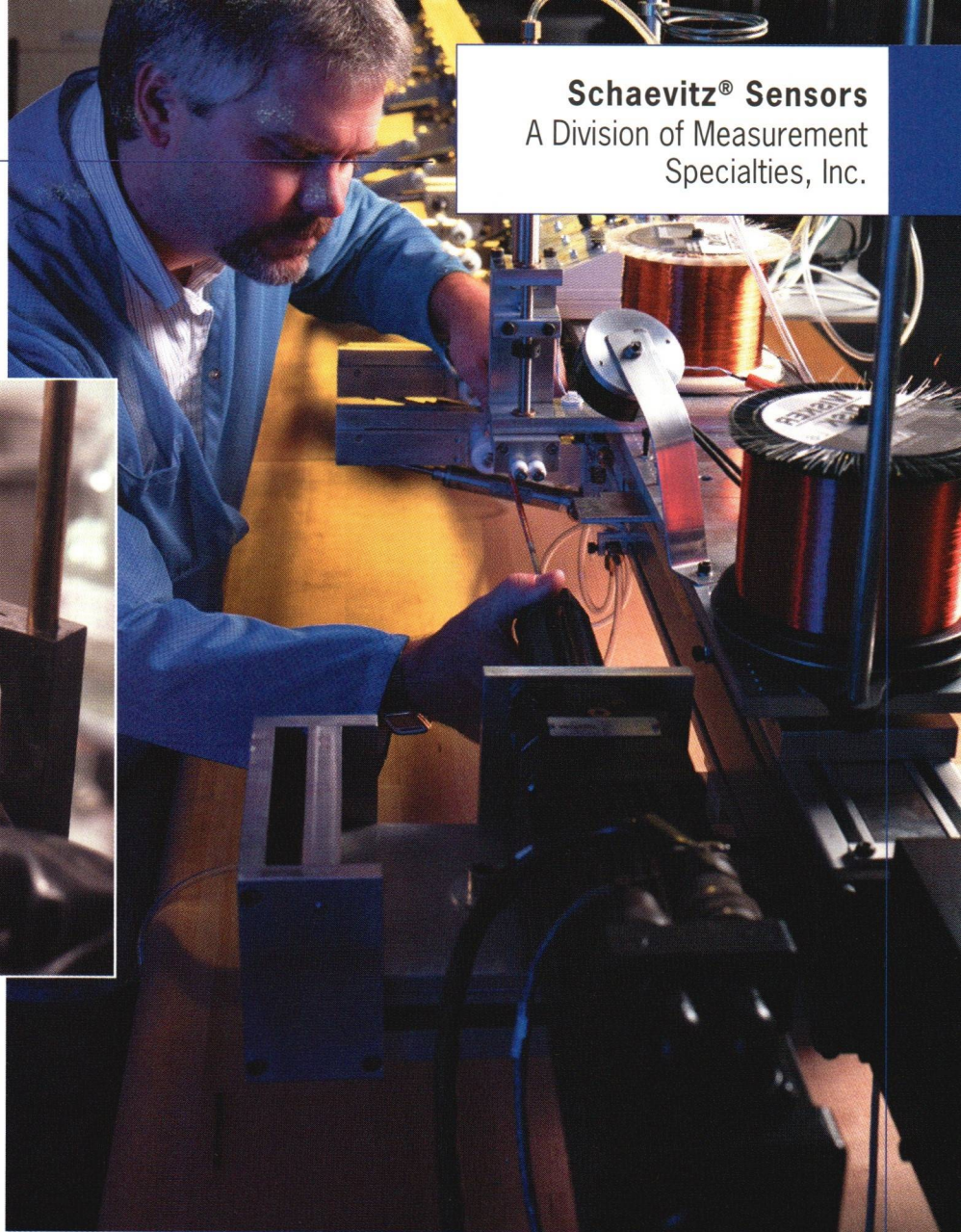
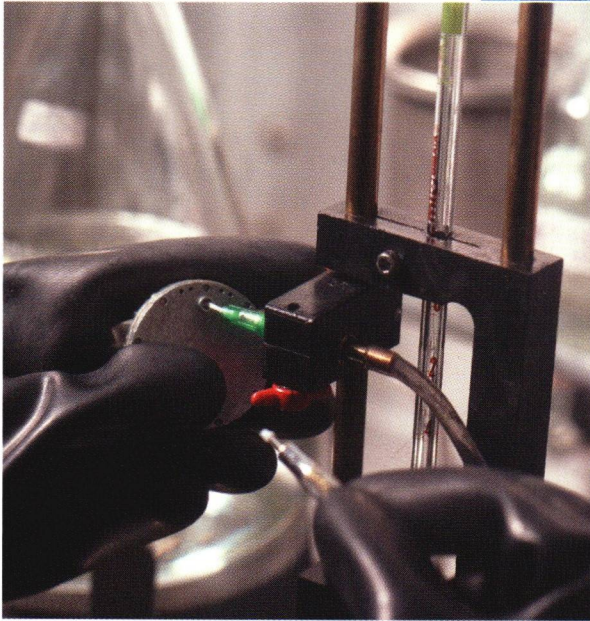
LVDTs, RVITs, RVDTs

Schaevitz's LVDT (linear variable differential transformer) technology developments, and LVDT products, are known and used by design engineers at the world's most advanced companies and throughout the globe. For decades, Schaevitz® has offered not only LVDTs, but also position transmitters, dimensional gage heads, magnetostrictive linear displacement transducers, and instrumentation including signal conditioners, transmitters, microprocessor-based readouts/controllers and data acquisition systems. Schaevitz® has also developed deep lines of rotary position sensors such as RVDTs and RVITs; tilt sensors including electronic clinometers and protractors; pressure sensors including high reliability silicon, digitally compensated, strain gauge; specialty application sensors; and fluid level sensors.

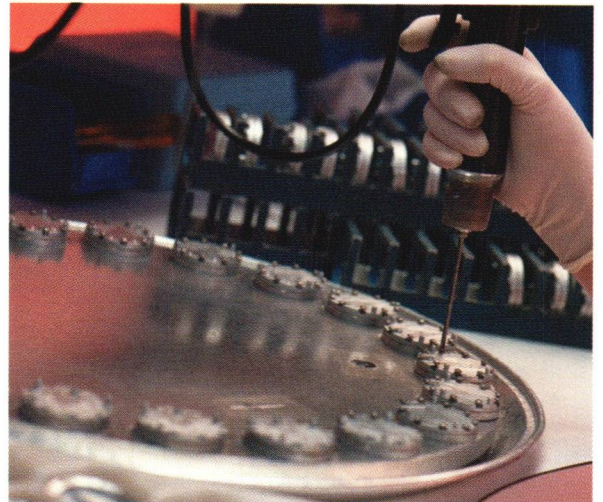


Commitment to Quality

Schaevitz® Sensors
A Division of Measurement
Specialties, Inc.



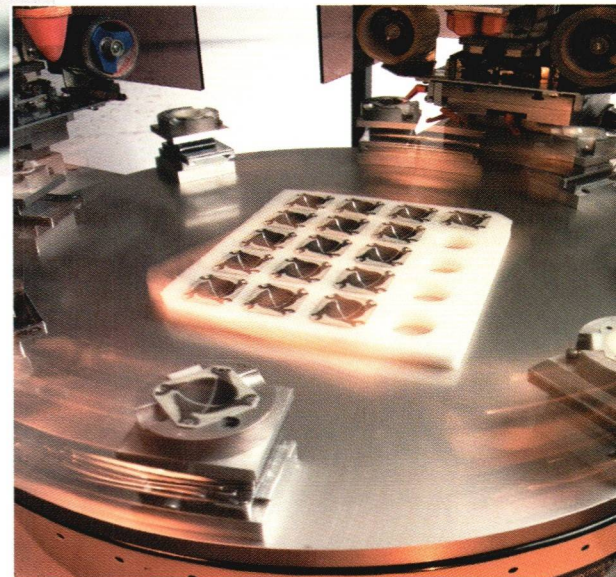
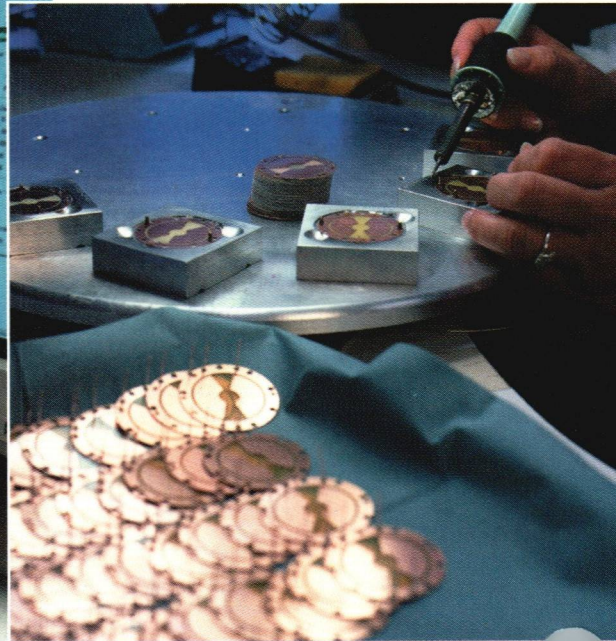
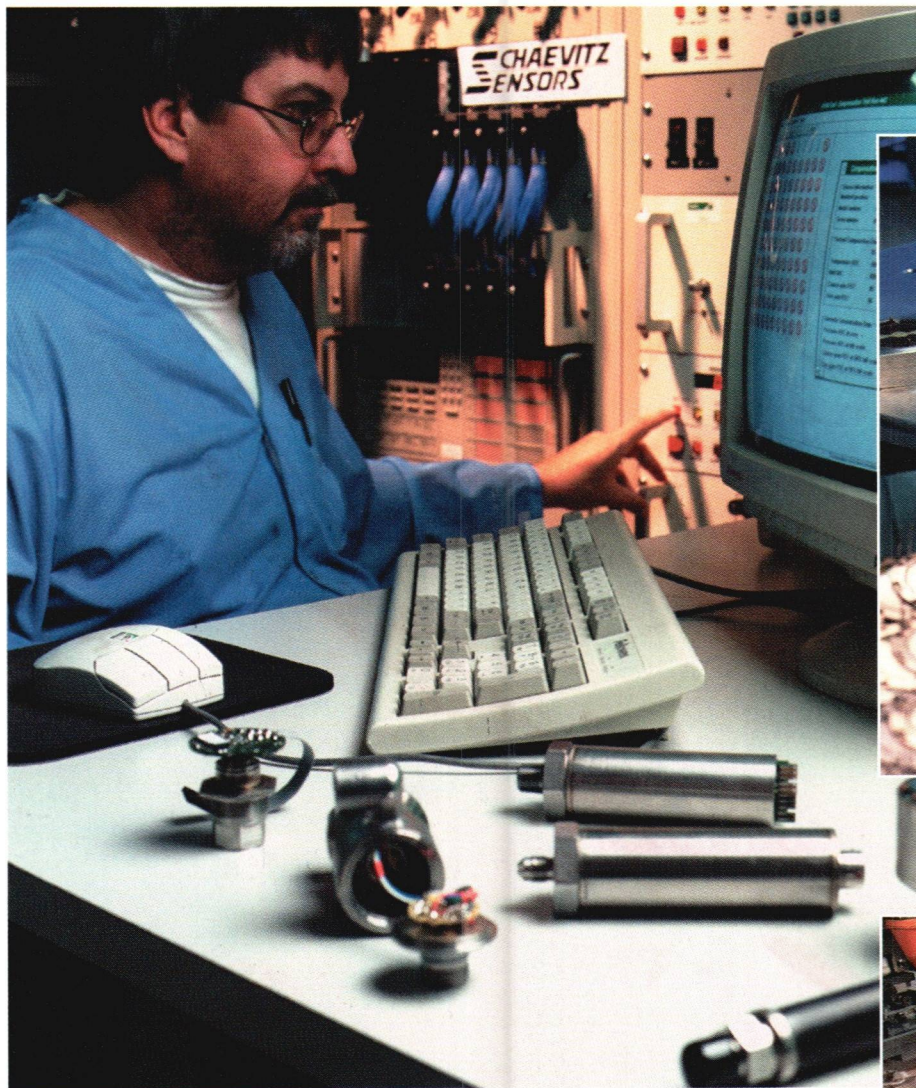
Schaevitz® Sensors products are manufactured in an ISO 9001 certified environment, assuring that our products comply with the appropriate, internationally-recognized standards for quality management and assurance. Throughout the design, development and production cycles, our processes and our staff — among the world's most experienced — ensure that you will receive the best quality sensor product. Every Schaevitz® sensor is absolutely guaranteed to meet your application's rigorous needs.



SCHAEVITZ
SENSORS

Schaevitz® Sensors

Manufacturing Expertise.



After decades of experience in the design, development and manufacturing of quality industrial sensors, Schaevitz® has already encountered virtually every manufacturing problem imaginable, worked through them, and found the means to manufacture your sensor order at the lowest possible cost. Together with its parent company, Measurement Specialties, Inc., Schaevitz® can rely on facilities for R&D, design, sales, and manufacturing throughout the world, including Fairfield, New Jersey; Hampton, Virginia; Newport News, Virginia; Valley Forge, Pennsylvania; Milpitas, California; Slough, England; Hong Kong; and Shenzhen, China.



This catalog contains our complete line of standard sensor products, but we also offer a wealth of product technologies, including modified and custom sensor solutions. If you don't find exactly what you need in this catalog, please call to discuss your application with our engineering staff at (757)766-1500. In addition to the specifications in this catalog, access to technical information is available around the clock via our Document Fax Back system and our web site (www.schaevitz.com). See page 17 for further details.

Linear Displacement Technologies

from Schaevitz® Sensors

LVDTs

See pages 31 – 61

A half century ago, the LVDT (Linear Variable Differential Transformer) was relatively unknown except to a few specialists in process control instrumentation.

Through the pioneering efforts of Schaevitz® Engineering, the LVDT has evolved from a rarely used curiosity to a fundamental means for measuring displacement.

Today, LVDTs are widely used as measurement and control sensors wherever displacements of a few microinches to several feet can be measured directly, or where other physical quantities, such as force or pressure, can be converted to linear displacement.

Largely because it is capable of extremely accurate and repeatable measurements in the most severe environments, the Schaevitz® LVDT has become the sensor of choice for thousands of industry's most critical applications.

With advances in engineering and manufacturing technology, the LVDT products that were once limited to the most exclusive designs are now cost-effective for mainstream industrial and OEM applications requiring accurate, reliable displacement measurement.



Position Transmitters

See pages 62 – 72

Schaevitz® LVDT Transmitters provide accurate position measurement sensing in the harshest and most remote installations. The systems consist of an LVDT position sensor with matching signal conditioning and transmitter electronics (either built in or remotely located).

Transmitter systems are especially suited for remote process industry applications, such as valve position indication, in which AC power is not readily available to operate line powered signal conditioning. The loop powered system transmits a 4-20 mA output into 2-wire current loops which can go directly to the process controller.

Packaged in rugged splashproof or hermetically sealed housings, LVDT transmitters endure the most adverse installations. Several models are available with measurement ranges up to 10".



Linear Displacement Technologies

from Schaevitz® Sensors

Dimensional Gage Heads

See pages 73 – 100

LVDT gaging probes provide the data collection capability for most of today's automated dimensional data acquisition systems. When implemented in the manufacturing process, LVDT gaging probes, or gage heads, provide dimensional feedback on manufactured parts for in process quality control and post-process statistical analysis.

Several variations of Schaevitz® dimensional gage heads, including hermetically sealed, miniature, and non-contacting models are built to meet most metrology, process control and dimensional data acquisition requirements for SPC.

Throughout the manufacturing process, Schaevitz® dimensional gage heads are subjected to stringent quality procedures. Prior to shipment, all gage heads are calibrated to NIST traceable standards using computerized testing equipment. Each transducer is supplied with linearity and sensitivity calibration data.



MagneRule Plus™

See pages 101 – 110

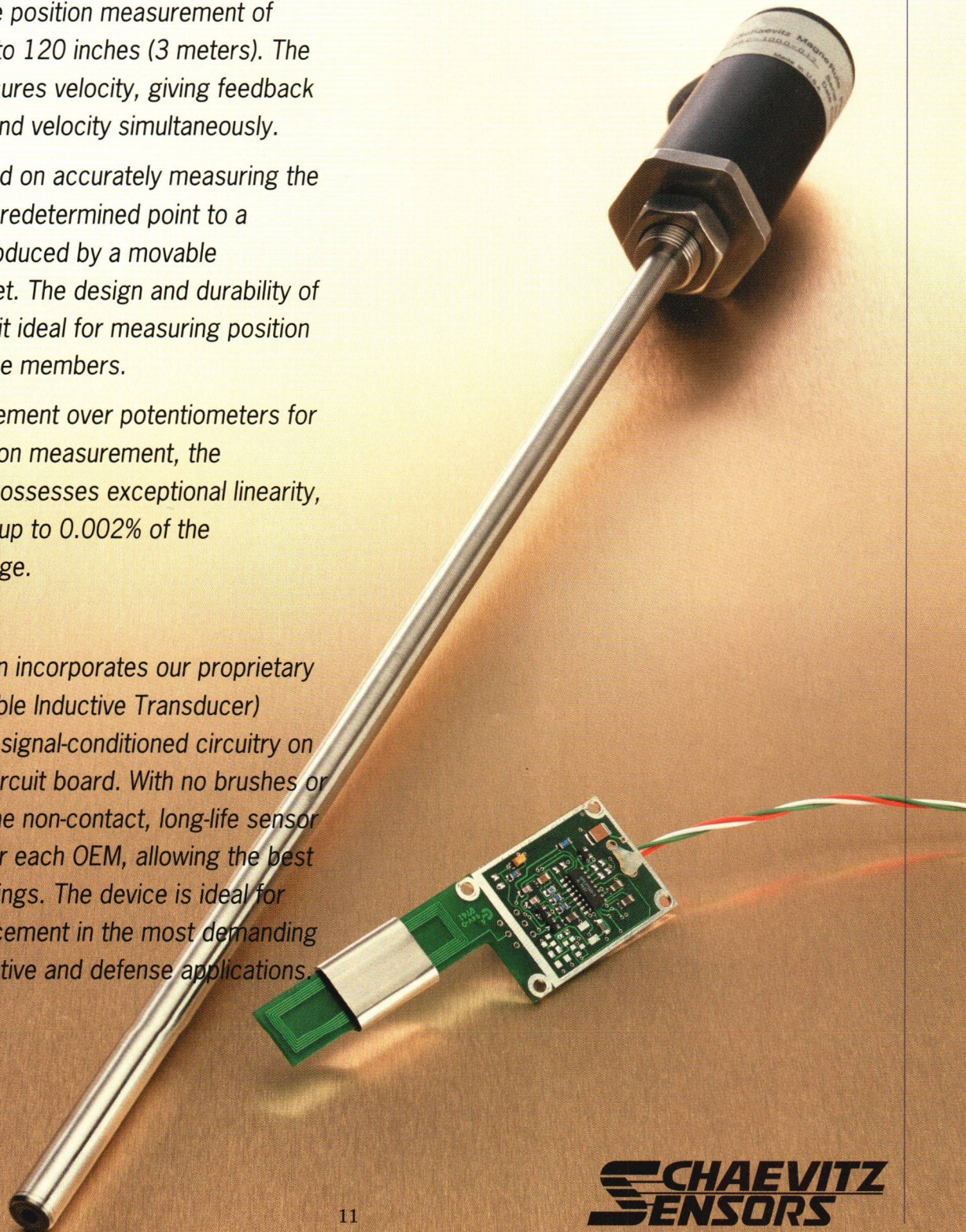
The MagneRule Plus™ magnetostrictive linear displacement transducer provides highly accurate absolute position measurement of displacement up to 120 inches (3 meters). The sensor also measures velocity, giving feedback of both position and velocity simultaneously.

Operation is based on accurately measuring the distance from a predetermined point to a magnetic field produced by a movable permanent magnet. The design and durability of the sensor make it ideal for measuring position of moving machine members.

A marked improvement over potentiometers for long stroke position measurement, the MagneRule Plus possesses exceptional linearity, with repeatability up to 0.002% of the measurement range.

LVIT-Z

This unique design incorporates our proprietary LVIT (Linear Variable Inductive Transducer) technology and a signal-conditioned circuitry on a single printed circuit board. With no brushes or wipers to wear, the non-contact, long-life sensor is reconfigured for each OEM, allowing the best possible cost savings. The device is ideal for measuring displacement in the most demanding industrial, automotive and defense applications.



Linear & Rotary Displacement Technologies

from Schaevitz® Sensors

Instrumentation

See pages 111 – 128

To complete your measurement system, we supply a full line of LVDT compatible signal conditioners and microprocessor-based readouts/controllers. As the premier manufacturer of LVDTs and LVDT gage heads, Schaevitz® is uniquely qualified to offer instrumentation that eliminates the problems when transducers are supplied by one manufacturer, instrumentation by another, and, unfortunately, the user is caught in the middle trying to interface the two. With Schaevitz®, your displacement measurement system is assured to perform as designed.

LVDT Instrumentation products perform a number of signal conditioning functions necessary to complete an LVDT measurement system. These functions include excitation, amplification, demodulation, signal filtering, digital readout of position values and microprocessor-based system control in conjunction with relays, TTL logic, and other controls.

For applications involving numerous measurement variables, our PC-based dimensional data acquisition system collects, processes and displays measurement information for real-time data management and post-process statistical analysis with your SPC program.

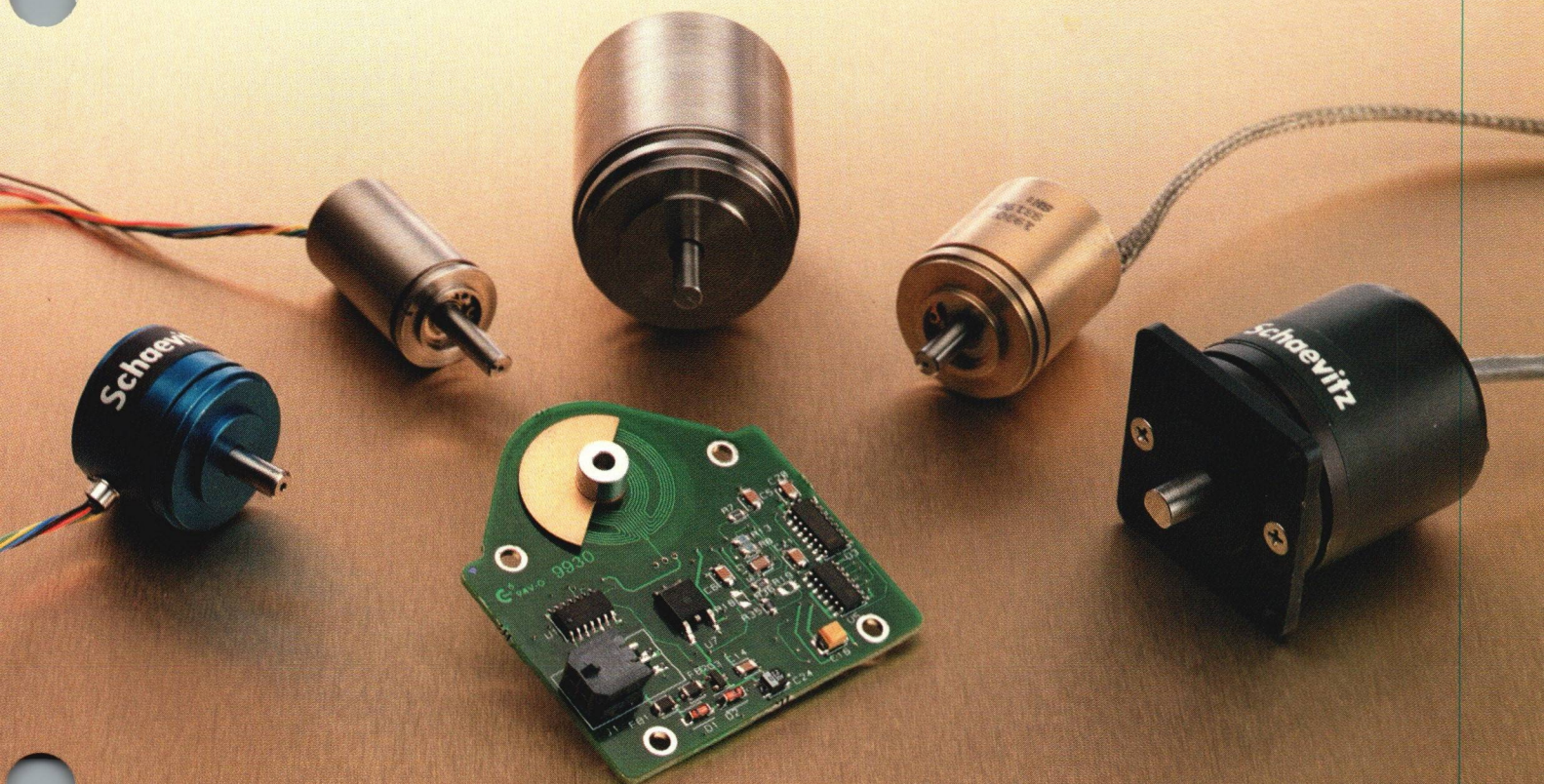


Rotary Position Sensors

See pages 129 – 144

Rotary position transducers incorporate a range of features and technologies designed to meet diverse rotary position measurement requirements. Our complete line of rotary transducers satisfies both general and specialized applications, offering high reliability for absolute rotary position measurements. Standard features include a noncontact design, virtually infinite rotational life, a fully signal conditioned output, infinite resolution, and 360 degree rotation. We also offer a variety of options which users can select to achieve a superior solution to virtually any rotary measurement problem.

Units requiring special form or function can be developed to meet specific program requirements. Our applications engineers are ready to answer your calls and discuss cost-effective solutions for your specific requirements. Standard rotary position transducers for many applications are available from stock for next day shipment.



Tilt Sensor Technologies

from Schaevitz® Sensors

Tilt Sensors

See pages 145 – 160

Schaevitz® Sensors manufactures a comprehensive line of electronic clinometers and systems for the precise measurement of level, angle or tilt. The unique, patented designs feature a wide range of performance parameters, interface options, and price alternatives. Complete capabilities . . . standard models or custom engineered.



Pressure Sensing Technologies

Pressure Sensors

Silicon
Foil Strain Gauge
LVDT

Pressure Sensors

See pages 161 – 214

Schaevitz® pressure sensors integrate the latest sensing technologies with proven design and engineering techniques. Utilizing silicon, foil strain gauge and Linear Variable Differential Transformer (LVDT) technologies, the Schaevitz® diversified family of pressure measurement products meets a wide variety of application requirements.

Our pressure transducers perform in demanding environments such as power plants, water treatment facilities, aircraft and marine hydraulic systems, nuclear testing, flight-qualified systems, and a number of energy management and climate control systems.

Many Schaevitz® pressure products are available with selected options that provide custom features within the cost parameters of standard catalog products. We also have the engineering expertise to develop special sensor configurations for volume applications.

MSP Series Pressure Sensors

Measurement Specialties, Inc. offers a line of MSP Series pressure sensors. See pages 215-231 and the inside back cover for information on these pressure products.



Fluid Level Sensing Technologies

from Schaevitz® Sensors

Fluid Level Sensors

See pages 215 – 218

Schaevitz® Sensors innovative fluid level sensors are custom designed for the most restrictive and harshest environments. Ideal for use in truck, automotive, marine, and off highway vehicles engines; transmissions; industrial speed reducers; hydraulic reservoirs; air compressors; turbine engines; generators and more.

The heart of the sensor is a uniquely suspended float element whose buoyancy causes slight relative motion. This small movement of the magnet-topped float, in relationship to a Hall Effect device, provides a definitive indication of fluid level with exceptional repeatability. AccuStar fluid level sensors can be adapted to a wide range of measurement requirements.



Schaevitz® Sensors On Line

Schaevitz® Sensors is among the world's leading designers and manufacturers of sensor and sensor-based systems. With hundreds of standard units available from stock, we can satisfy most sensing requirements off-the-shelf, and many of our more popular sensor products can be purchased on line at **www.schaevitz.com**

Schaevitz® Product Engineering Resources

Since many sensor applications call for a customized solution, we work with our customers — like an extension of their engineering department — to develop a design that meets their specific performance and budget requirements. Matching electronics such as signal conditioners and readouts to support these and other transducer-based applications are an important aspect of our product line—we build solutions, not just components.

More than five decades of research and product evolution have gone into the development of Schaevitz® Sensors products, and our reputation for quality, innovative products has kept the Schaevitz® name on the leading edge of advanced sensor technology.

Other Sensor and Measurement Products From MSI

Schaevitz® Sensors is a division of Measurement Specialties, Inc. Please contact us for more information on the larger family of sensors and measurement technologies available through MSI. An overview of MSI products are listed on the inside back cover of this catalog.

On-line Information — When You Need It, Where You Need It

Looking for more information? Need it yesterday! www.schaevitz.com offers a comprehensive on-line resource of application reports, installation and service manuals, data sheets and more—which you can access and print anytime, anywhere!

In addition to our website, our DOCUMENT FAX BACK SYSTEM is a free service that you can access through our website or by phone. You can browse through our website, and then fax the information you want to yourself or to another location as needed.

Here's how it works:

1. Call our DOCUMENT FAX BACK SYSTEM phone number or access the program by following the instructions on our website.
2. Voice menus will guide you through selections. Choose up to five documents during each session.
3. To request documents, enter the 4-digit fax code followed by the # key. The system will confirm your selections.
4. You will be prompted to enter the fax number designated to receive the document(s). To assist the retrieval, you may enter a name, phone number or extension, which will appear on the cover page of the fax. The system will confirm your selection.
5. The DOCUMENT FAX BACK SYSTEM will make three attempts at 5-minute intervals to call a fax machine that is busy.

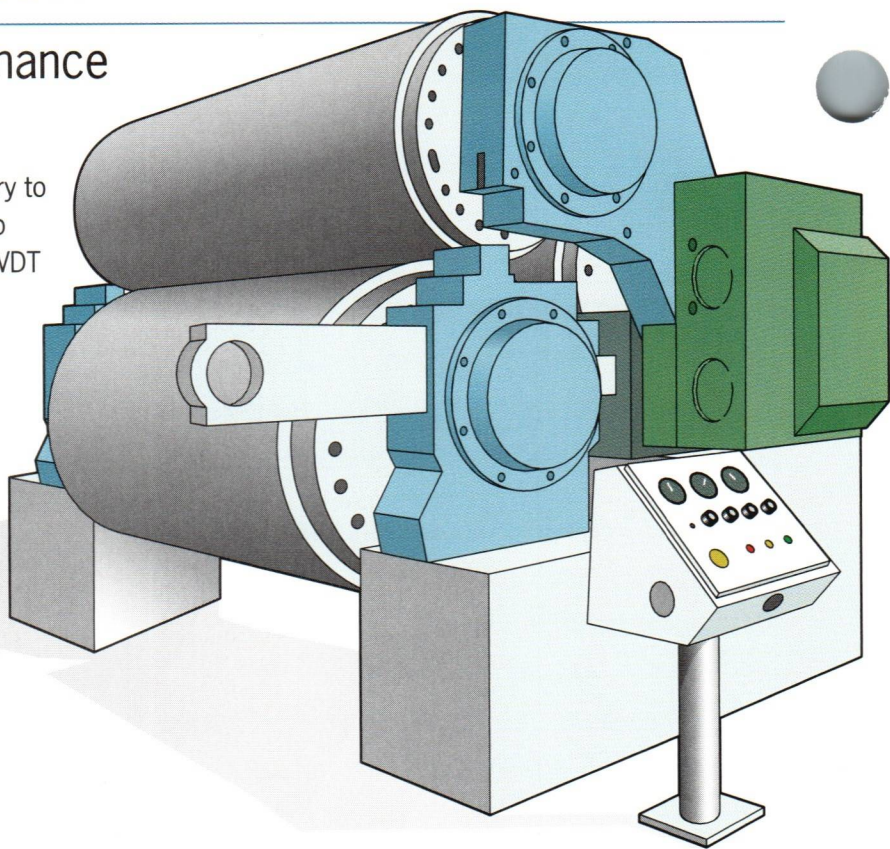
**SCHAEVITZ
SENSORS**

Industrial Automation

Enhancing Machine Performance

Roller Gap

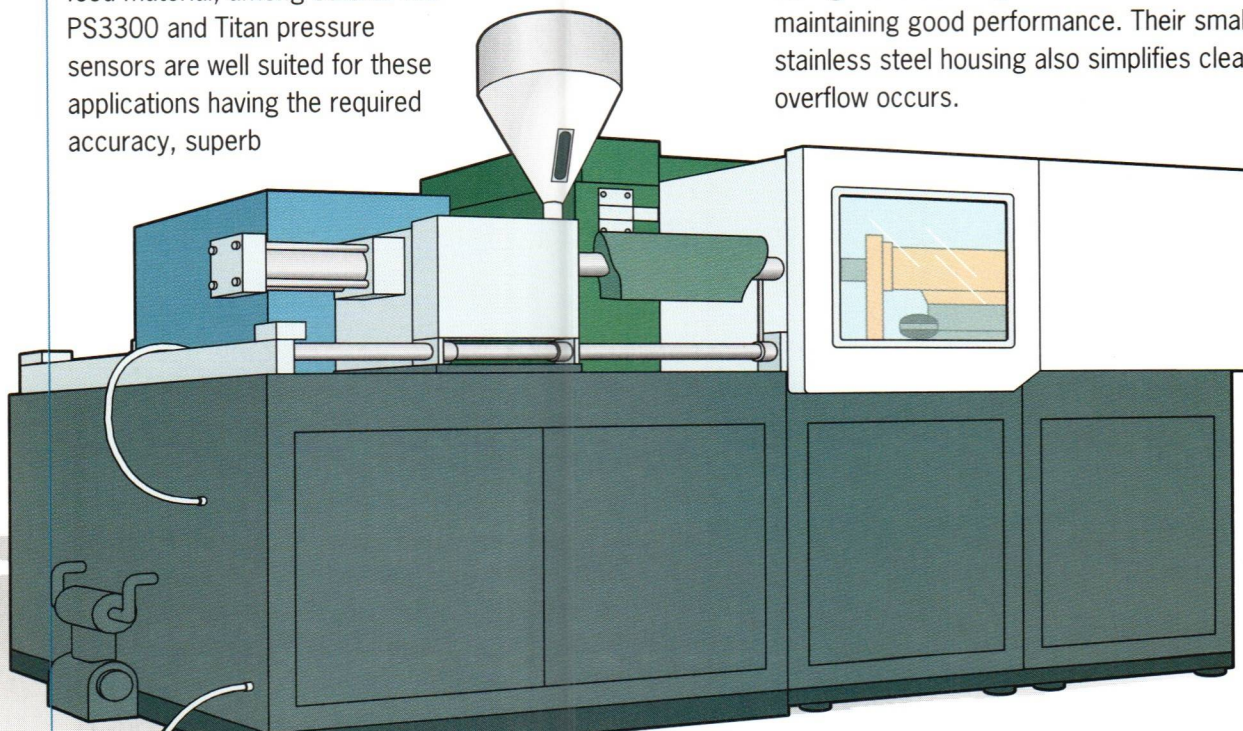
When rolling steel, aluminum, or paper it is necessary to measure the distance between the rollers in order to control the thickness of the material. Typically the LVDT body is attached to the fixed roller and the core is attached to the movable roller. As the gap between the rollers changes, the LVDT will provide analog voltage or current signals for position feedback. LVDTs are very rugged, industrial sensors that can withstand high temperature and vibration in dirty environments. Hermetically sealed, intrinsically safe transducers are available from stock.



Plastic Extrusion Machine

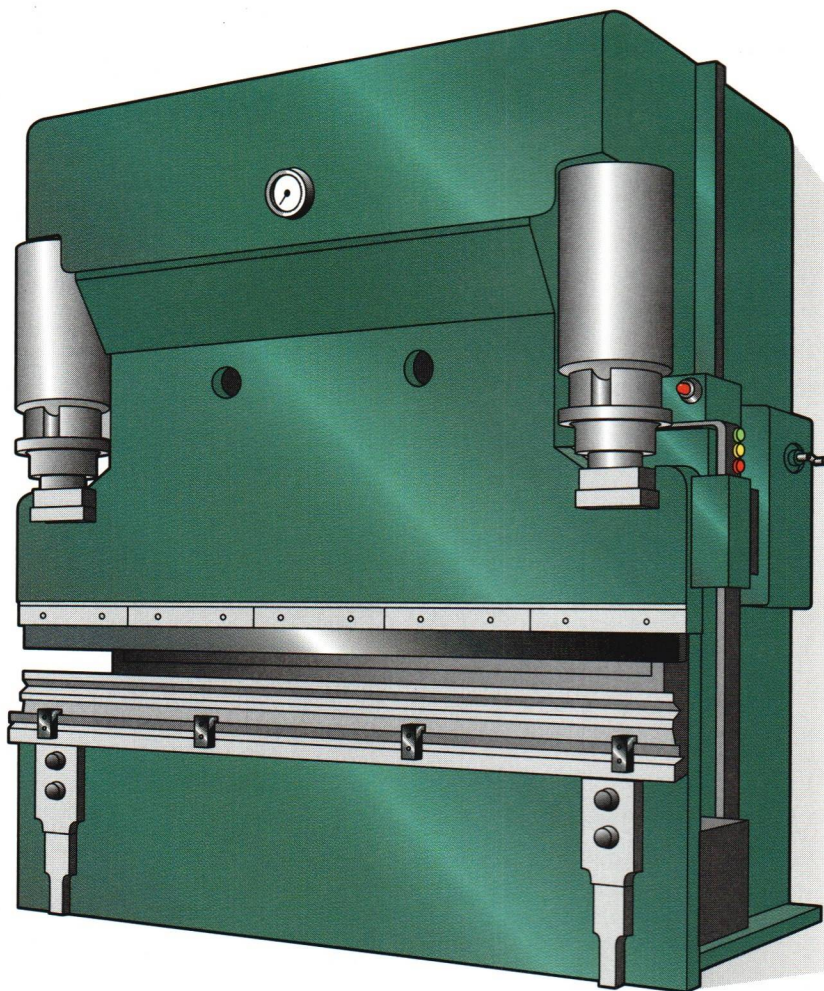
Plastic extrusion machines use pressure transducers and LVDTs to control and measure hydraulic and pneumatic pressure on the actuators that open and close the mold, feed material, among others. The PS3300 and Titan pressure sensors are well suited for these applications having the required accuracy, superb

repeatability high overload protection, and the close tolerances on zero and span. These sensors make installation and maintenance easy since no adjustments during manufacturing reduces installation costs while maintaining good performance. Their small size and stainless steel housing also simplifies cleaning when overflow occurs.



Single Ended/Battery Powered Displacement Sensors

The proliferation of programmable controllers and data collection systems requiring unipolar inputs has fostered the development of the SE series of LVDTs. Operating on 8.5 to 28 volts dc, the DC-SE and GCD-SE will supply a 0 to 5-volt dc or 1 to 6-volt dc output, dependent upon hook-up. The low 6 mA current requirement of the SE self-contained electronics makes this series an excellent choice for portable, remote battery operation, as well. The captive core option for the DC-SE helps to reduce the amount of user tooling required to implement the LVDT in the application. The GCD-SE series adds the additional convenience of a self-contained mounting system and spring loaded probe.



Pneumatic Linear Slide Position Feedback

Many pick and place applications require position verification. End point sensors and linear potentiometers are commonly used to provide this information. The problem with end point sensors is that their zero repeatability tends to be poor. Also, end point sensors provide no intermediate information between the fully extended and full retracted positions. Linear pots are initially acceptable, but since they depend on a contact wiper and conductive film, they degrade after a short period of time. This is particularly a problem in applications requiring dithering over a small portion of the full stroke. Proprietary LVIT technology, provides a low cost, non-contact solution to short stroke position feedback of linear pneumatic positioning devices. Patented Schaevitz® LVIT position-sensing technology provides a reliable, long-term measurement solution for your cylinder positioning requirements.

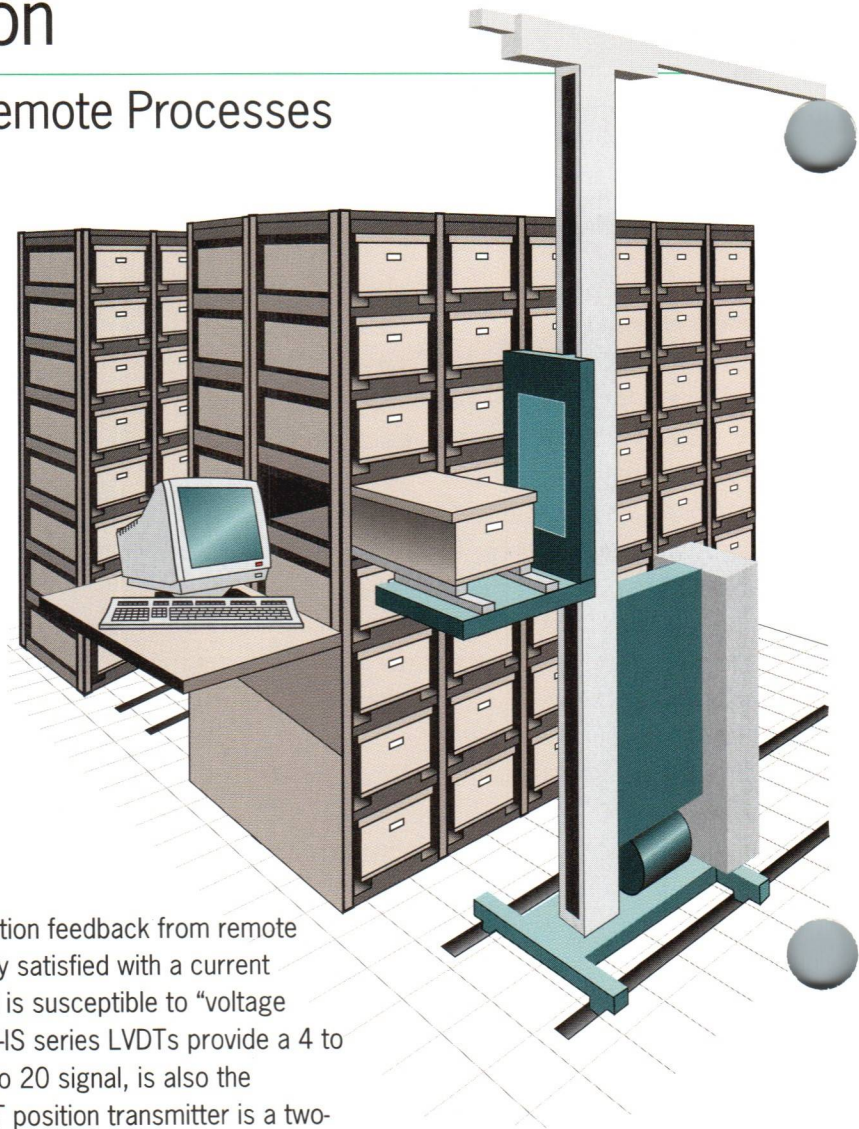
**SCHAEVITZ
SENSORS**

Industrial Automation

Monitoring and Controlling Remote Processes

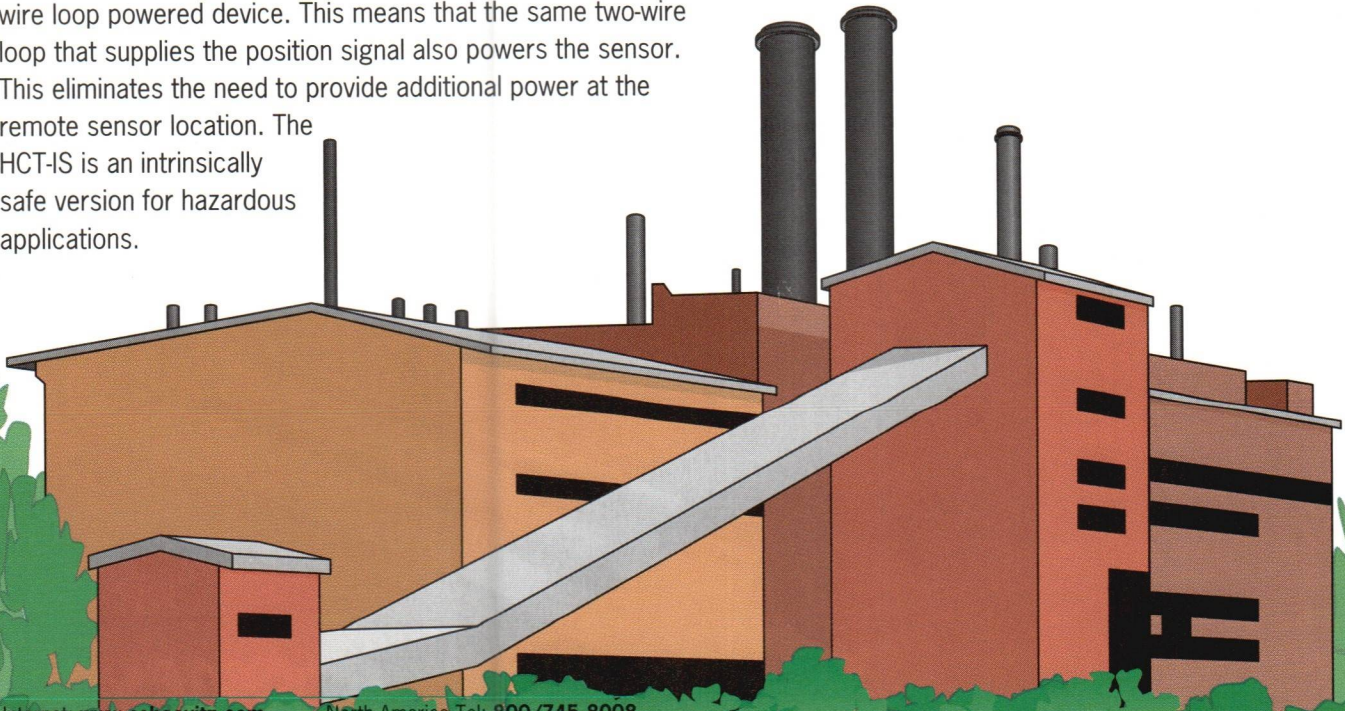
Long Stroke Cylinder Displacement

Able to withstand high pressure at the measurement probe, the Schaevitz® MagneRule™ is well suited for industrial hydraulic cylinder applications. The maximum operating pressure of 5,000 psi, 100 Hz frequency response, and 0.05 % accuracy make this device ideal for closed-loop position control on devices such as three-axis automated pick and place robots. The standard velocity output provides feedback information to your proportional control system to improve material handling efficiency.



Remote Location Feedback

The power and petroleum industries often require position feedback from remote locations. Transmitting signals over long runs is usually satisfied with a current transmitter rather than voltage signal. A voltage signal is susceptible to "voltage drop" and other external influences. The HCT and HCT-IS series LVDTs provide a 4 to 20 mA output proportional to sensor position. This 4 to 20 signal, is also the standard for most process control industries. The HCT position transmitter is a two-wire loop powered device. This means that the same two-wire loop that supplies the position signal also powers the sensor. This eliminates the need to provide additional power at the remote sensor location. The HCT-IS is an intrinsically safe version for hazardous applications.



Valve Position

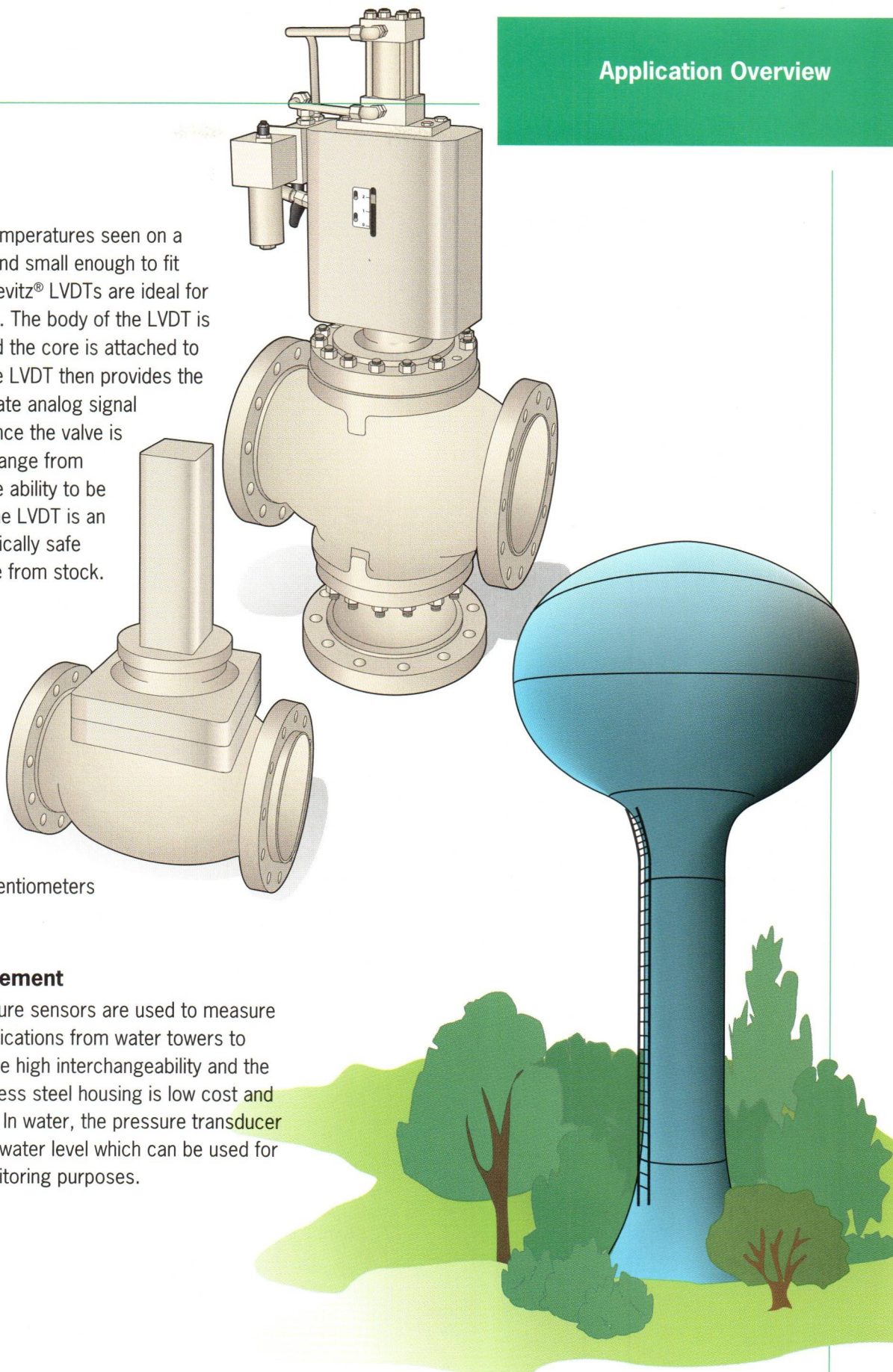
Able to withstand high temperatures seen on a gas or steam turbines, and small enough to fit inside an actuator, Schaevitz® LVDTs are ideal for controlling valve position. The body of the LVDT is attached to the valve and the core is attached to the closure member. The LVDT then provides the control system an accurate analog signal proportional to the distance the valve is open. With lengths that range from $\pm 0.005"$ to $\pm 10"$ and the ability to be used in a control loop, the LVDT is an excellent solution. Intrinsically safe transducers are available from stock.

Ball Valve Position

For long term, high reliability sensing of ball valve and actuator position, the RVIT-Z or R30A rotary sensor and CTS-420 position transmitter provide superior solutions to potentiometers and resistive elements.

Water Level Measurement

PS3300 and Titan pressure sensors are used to measure liquid levels in many applications from water towers to waste water facilities. The high interchangeability and the totally welded 316 stainless steel housing is low cost and ideal for this application. In water, the pressure transducer can accurately measure water level which can be used for level control and/or monitoring purposes.



Mobile Power Equipment

Increasing Safety and Performance

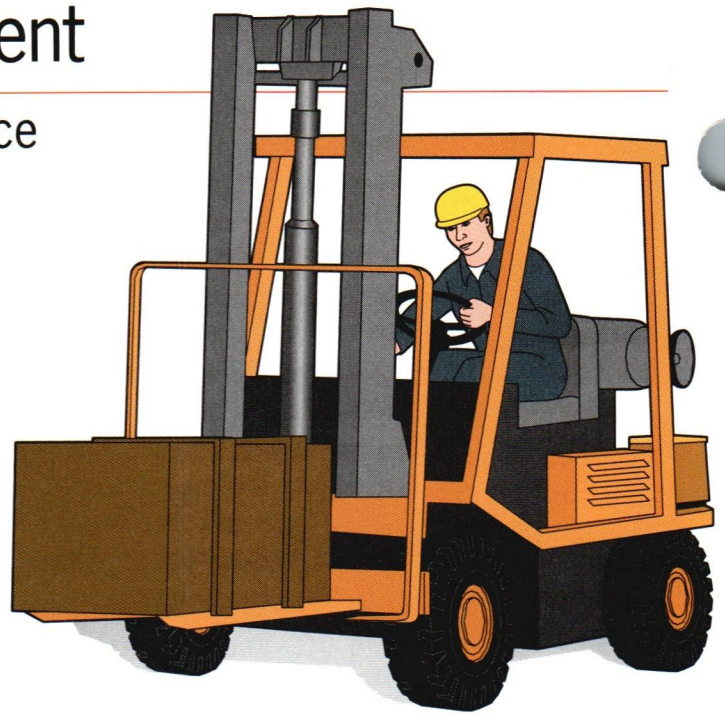
In construction and demolition applications where shock and vibration are a given, the AccuStar Electronic Clinometer has exhibited excellent performance time and again. Its high degree of reliability is a function of the design, which boasts no moving parts, high impact case and surface mount circuitry. From crane boom angle, to road grading to crawler drill position, the AccuStar is the industry performance leader.

Forklift Mast Tilt Angle

When used inside of or parallel to the tilt cylinder of a forklift, Schaevitz® LVIT sensors provide useful load monitoring information. The onboard computer uses this information, to prevent accidents due to overloading or improper load orientation.

Throttle Position

The RVIT Series rotary position sensor is widely used for material handling vehicle speed control position. Its long life and exceptional performance in harsh environments makes it a natural selection for these type applications.



Tip-over Protection

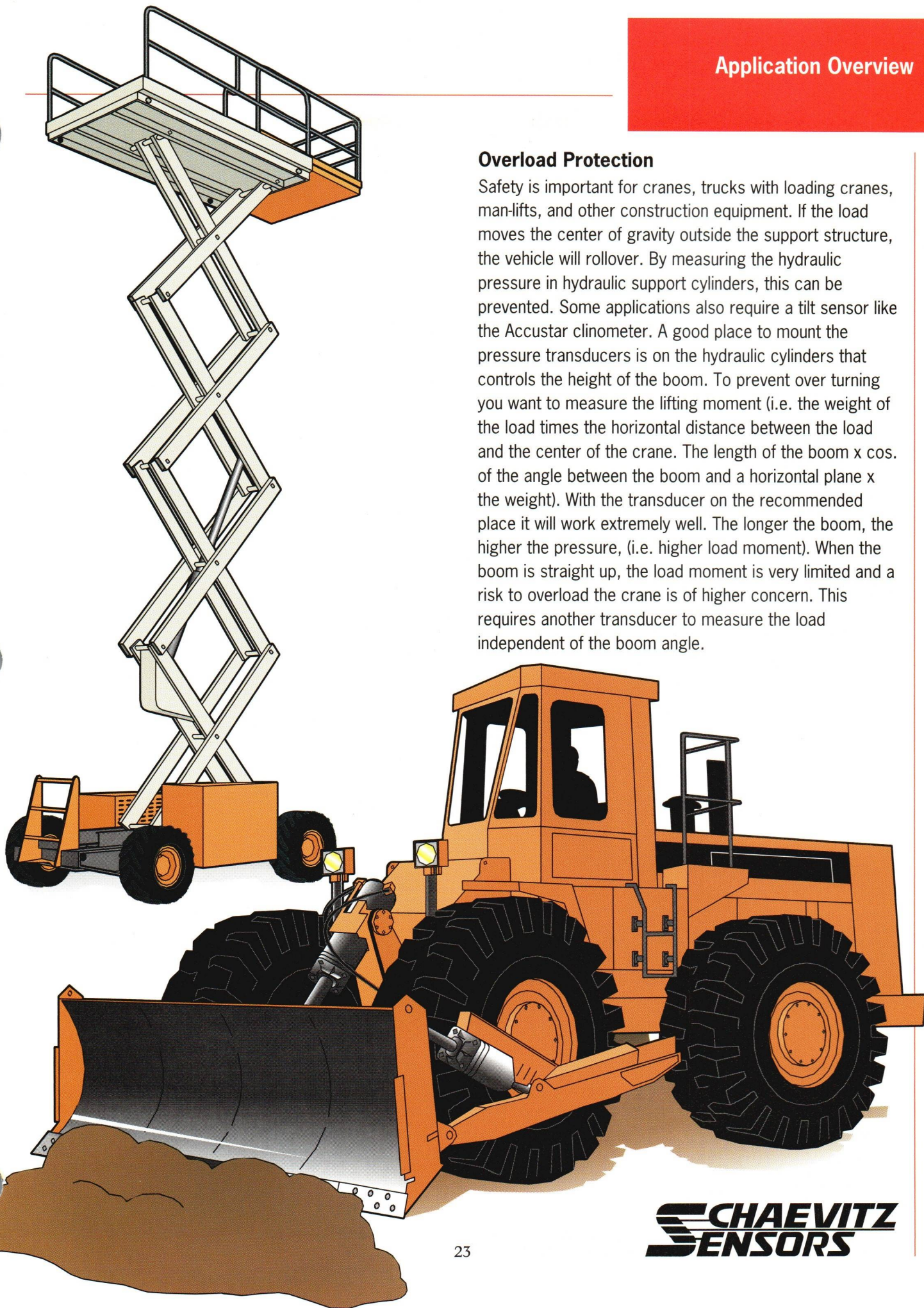
For tip-over protection on manlifts, cranes and telescopic material handlers, the AccuStar II/DAS-20 provides a cost effective, electronic sensing solution to antiquated pendulum and mechanical type devices. With individual analog and digital outputs for both X and Y axis', the AccuStar II is easily integrated into most systems. Custom sensors with programmable TTL outputs are also available.

The P900 has a positive overload stop that makes it excellent in hydraulic cylinder applications where high overloads or hammer effects are common.



Overload Protection

Safety is important for cranes, trucks with loading cranes, man-lifts, and other construction equipment. If the load moves the center of gravity outside the support structure, the vehicle will rollover. By measuring the hydraulic pressure in hydraulic support cylinders, this can be prevented. Some applications also require a tilt sensor like the Accustar clinometer. A good place to mount the pressure transducers is on the hydraulic cylinders that controls the height of the boom. To prevent over turning you want to measure the lifting moment (i.e. the weight of the load times the horizontal distance between the load and the center of the crane. The length of the boom $\times \cos$ of the angle between the boom and a horizontal plane \times the weight). With the transducer on the recommended place it will work extremely well. The longer the boom, the higher the pressure, (i.e. higher load moment). When the boom is straight up, the load moment is very limited and a risk to overload the crane is of higher concern. This requires another transducer to measure the load independent of the boom angle.

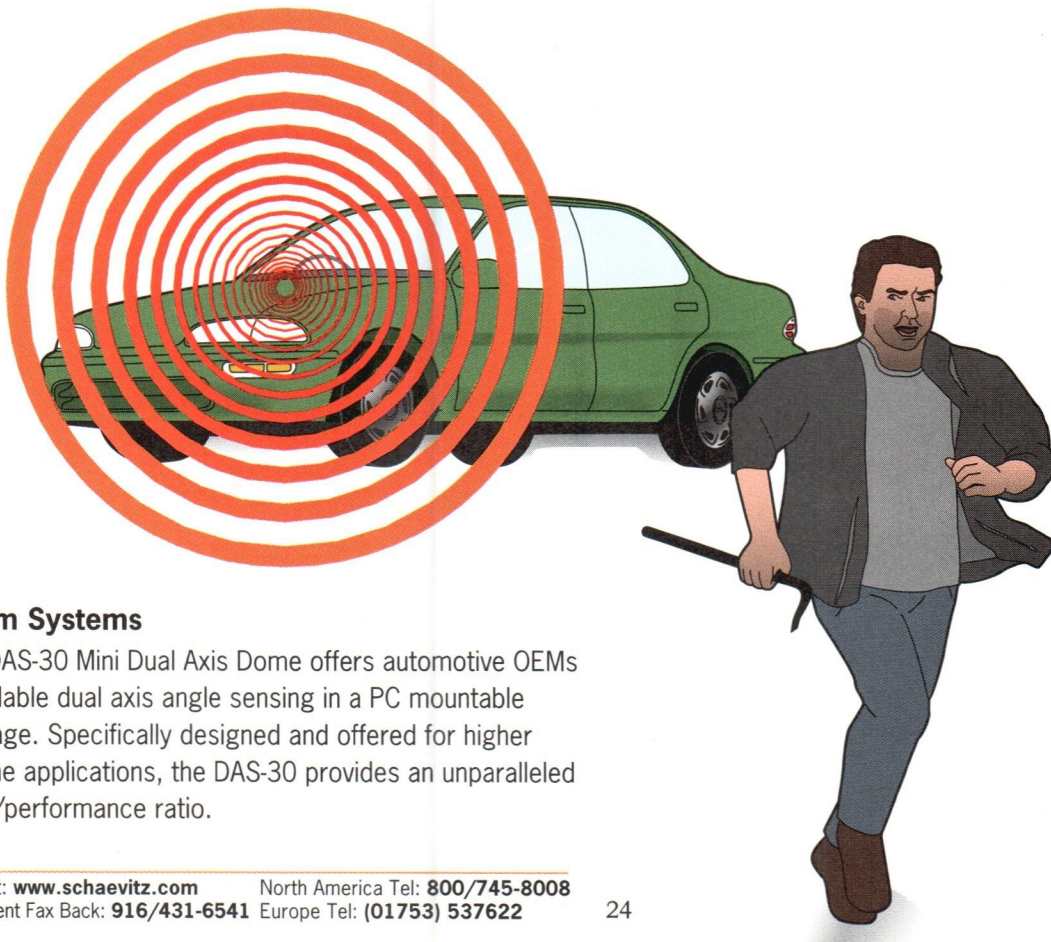
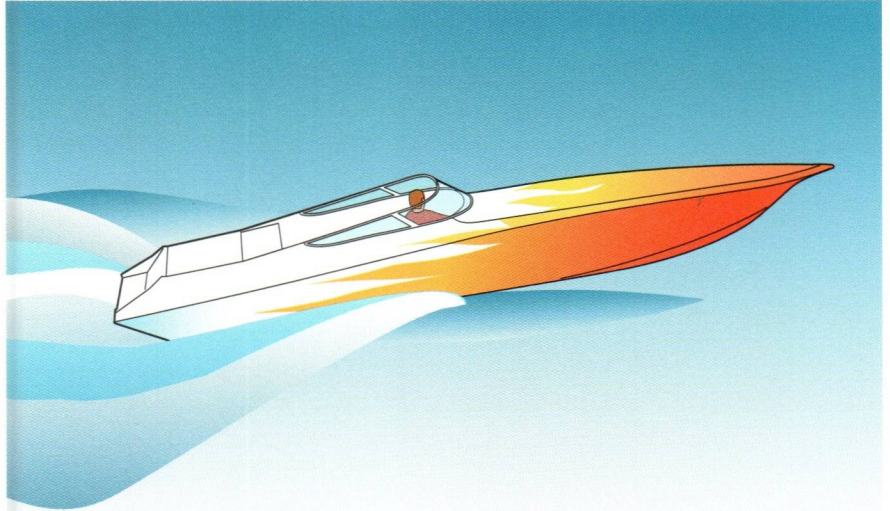


Consumer Products

Increasing Convenience, Safety and Performance

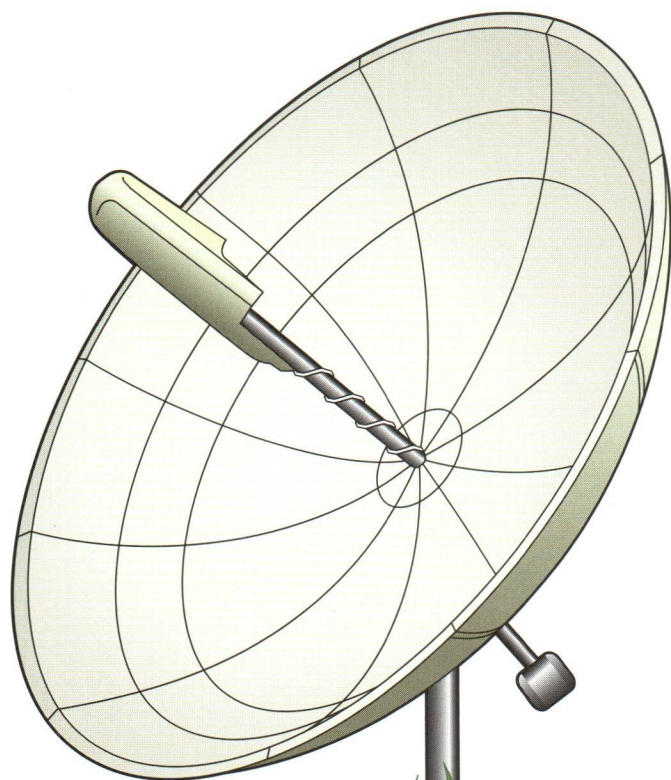
Throttle Position

The RVIT Series rotary position sensor is ideal for accelerator position sensing. Its long life and exceptional performance in harsh environments make it a natural selection for these type applications.



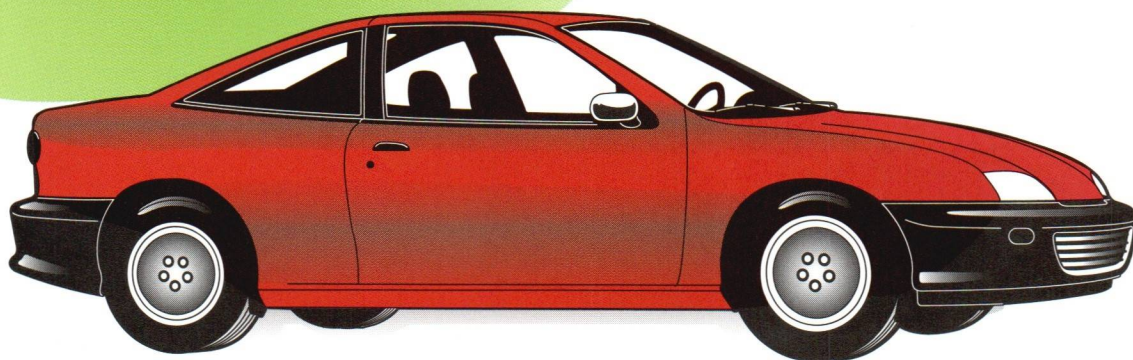
Alarm Systems

The DAS-30 Mini Dual Axis Dome offers automotive OEMs affordable dual axis angle sensing in a PC mountable package. Specifically designed and offered for higher volume applications, the DAS-30 provides an unparalleled price/performance ratio.



Satellite Antenna Positioning

The AccuStar Electronic Clinometer provides accurate angle data for satellite antenna positioning systems. For antenna leveling applications where dual axis angle data is required, the AccuStar II/DAS-20 is used.



Active suspension systems

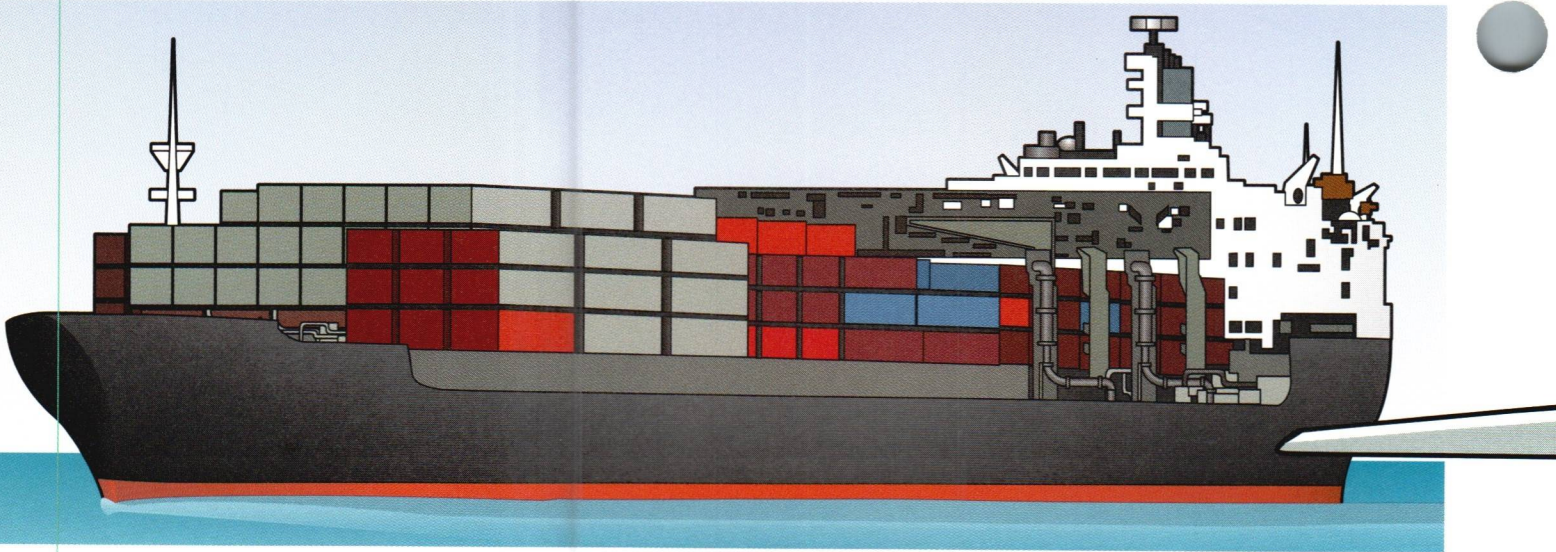
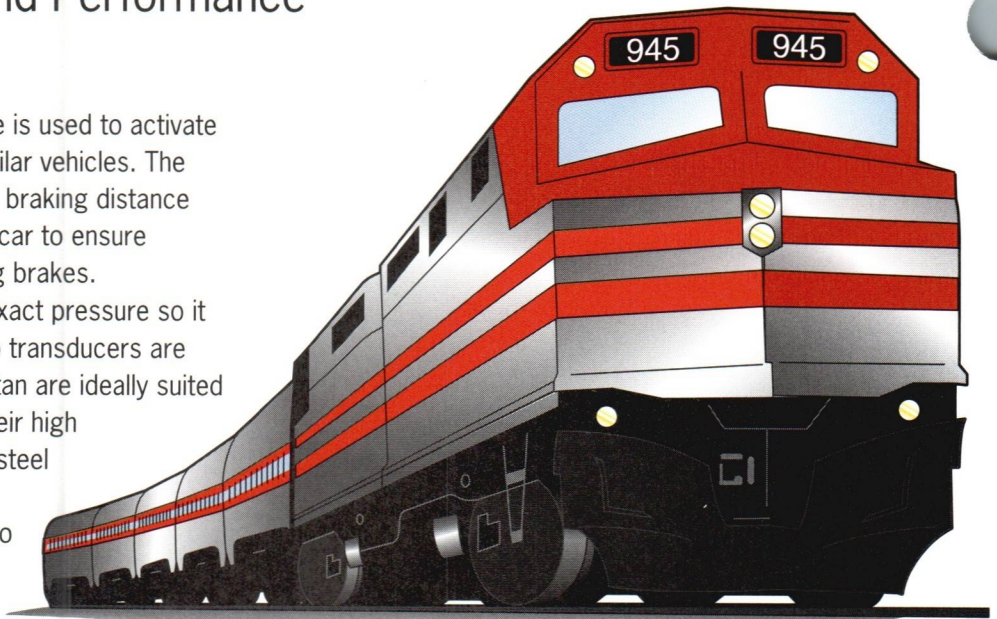
The LVIT technology lends itself well to high volume, low cost applications. Major OEM automotive equipment manufacturers have evaluated the Schaevitz® LVIT technology for active suspension applications. Because of the simplicity of the coil design and low component count, this non-contact, Schaevitz® position technology is well suited for the high reliability requirements and difficult environmental conditions of this application.

Commercial Transportation

Increasing Safety and Performance

Train Braking Systems

Both pneumatic and hydraulic pressure is used to activate the brakes on trains, subways and similar vehicles. The pressure is directly proportional to the braking distance and should be the same on each train car to ensure smooth braking and eliminate dragging brakes. Obviously, it is important to know the exact pressure so it can be properly controlled. One or two transducers are used on each car. Our PS3300 and Titan are ideally suited for train braking applications due to their high interchangeability and tough stainless steel housing. The transducers are vented through the cable, which allows them to be covered by snow and ice and still meet specified performance. This is also an ideal application for LVDTs to measure brake wear. This is done by measuring the stroke of actuator rods between the air cylinder and brake caliper.



Ships

The Schaevitz® Series of pressure sensors are suitable for ship board applications to measure and control numerous hydraulic applications such as motor controls, propeller pitch angle, crane and other loading/unloading equipment.



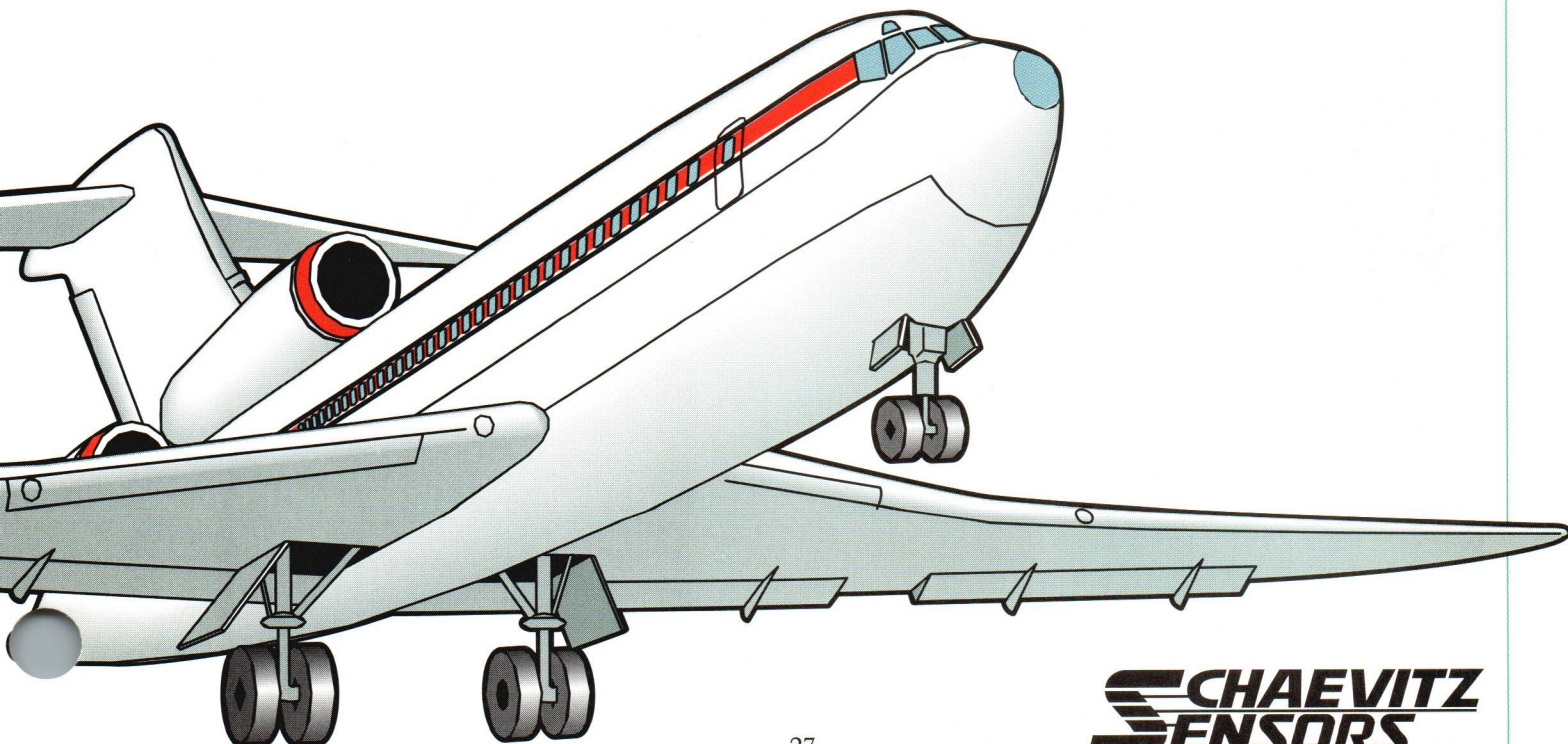
Onboard Aircraft Systems

Schaevitz® pressure sensors are found in a variety of commercial aircraft applications such as fuel pressure, altitude, speed, manifold pressure, oil pressure etc. Schaevitz® has developed a special version of the Titan for this market. The major changes are a hermetic connector and a stronger EMI/RFI protection. FAA has tested and approved Titan while working in the customer's application. There is no individual FAA approval for Titan. Apart from Titan, we also have pressure transducers for APU's, cabin pressure and other qualified projects requiring full MIL STD components. Our transducers are used to perform critical pressure measurements on the gas turbine APU (Auxiliary Power Unit) that provide onboard lighting and air circulation. Our P900 is used to maintain a comfortable cabin pressure onboard larger aircrafts.



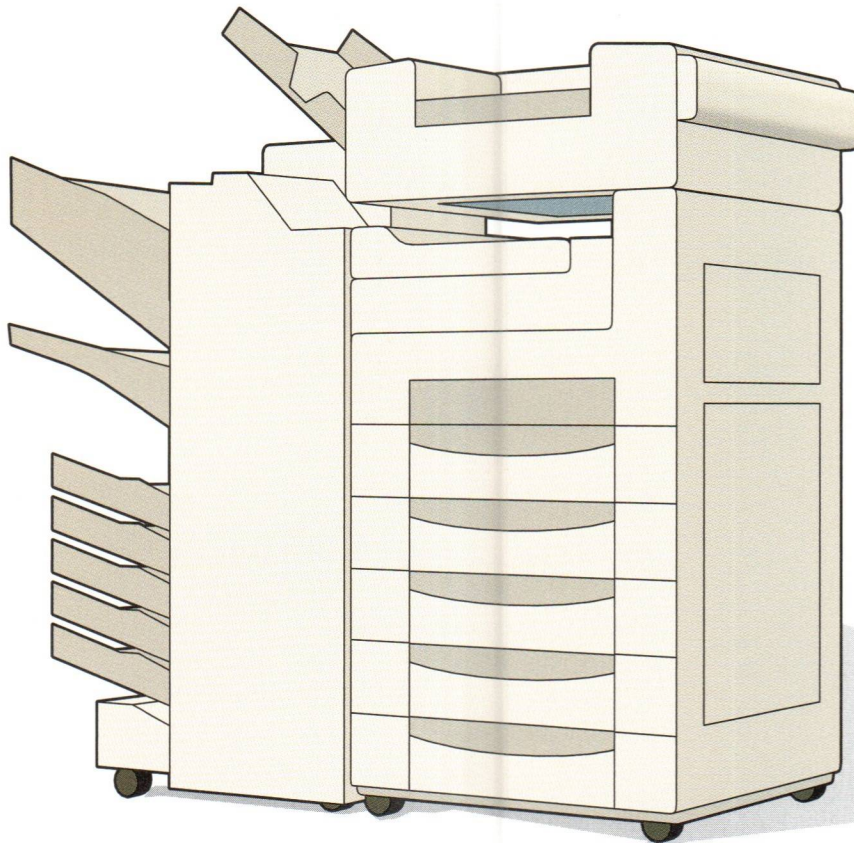
Aircraft Assembly

The GCD-SE gage head is used in a hand tool to measure the proper compression of rivet bucktails by sheet metal assemblers, during the airframe manufacturing process. A similar hand tool is used to measure the depth of the countersink process to insure a smooth surface after installation of the rivet. Operating on a single ended 8.5 to 28.0 VDC input and minimal 6 mA current draw, the GCD-SE is ideally suited to a wide range of such portable, battery powered measurement applications.



Commercial Equipment

Meeting Critical Reliability and Performance Requirements



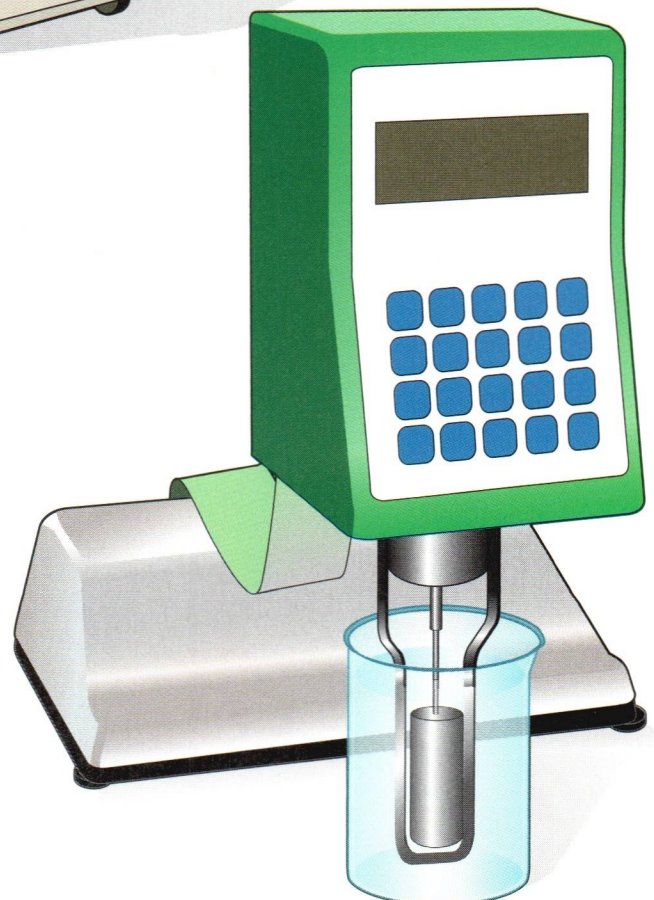
ATMs and Business Equipment Feed and Jam Detection

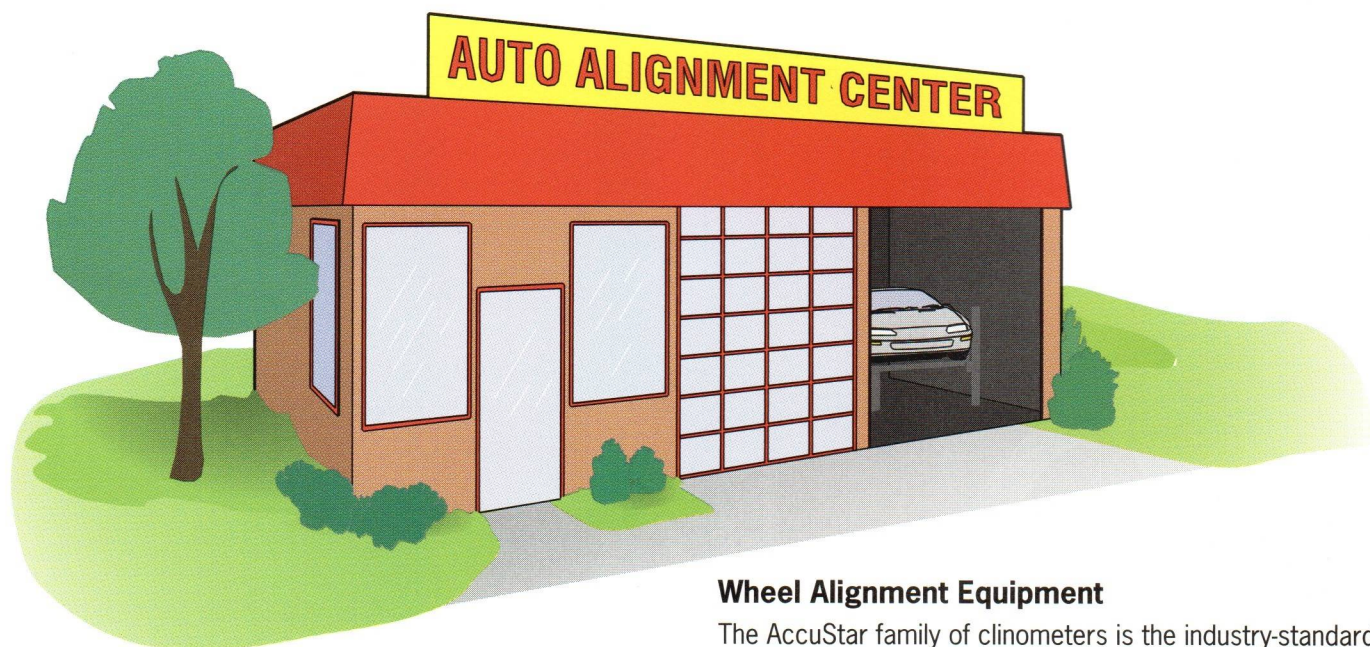
LVDTs are used on the feed rollers of automatic teller machine dispensing systems to detect double feed and no feed conditions. Copy machines use LVDTs to detect paper thickness and misfeeds. The LVDT offers many advantages over a mechanical switch. The linear output allows software adjustment of limit values instead of having to make mechanical adjustments to limit switches. The low mass of the core, high reliability and repeatability makes the MHR Series an excellent choice for this application. In OEM quantities, the LVDT is cost competitive with a limit switch.

Material Testing Instruments

In the broad field of material testing, LVDTs offer a solution for many of the harshest environments to the simplest of lab experiments. The LVDT can be mounted to measure creep in tension or compression by attaching the LVDT body to a fixed location and the core to the material (special fixturing may be required). When the load is applied to the material it will stretch (or compress). The LVDT will monitor even the smallest of motions (sub 0.0001") under varying pressures and/or temperatures (up to 1000°F) for weeks or even months. Being an absolute device, should there be a power loss, the LVDT will come back to its position reading when power returns saving many man hours of test time.

The low profile and total non-contact design of the RVIT-Z rotary sensor makes it the perfect choice for viscometer type applications, where no friction or drag can be tolerated.



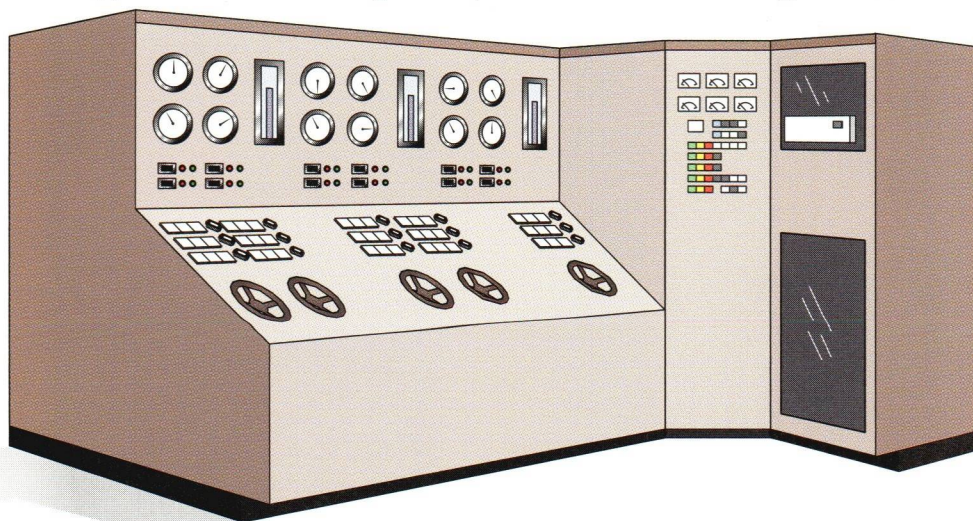


Wheel Alignment Equipment

The AccuStar family of clinometers is the industry-standard sensor of choice by wheel alignment machine manufacturers worldwide. The AccuStar level sensor is used for camber and caster angle measurement.

Test Stands

Many pressure transducers are used in test stands such as jet engine fuel control and diesel injector pump calibration. The PS10,000 is a popular pressure transducer for these applications due to its high accuracy, high frequency response, low temperature error and affordable price. The PS10,000 covers pressure ranges from 5 to 10,000 psi, has many different outputs and is very easy to install. With its tough stainless steel housing, the PS10,000 transducer can be used in applications both inside and outside. Other applications include testing of cars, aircraft and air conditioning modules.



"Extreme" Sensors for Extreme Environments

Schaevitz® Sensors Meets the Challenge of your Requirements



Steel Mills

Extreme applications require more than most pressure transducers can deliver. For more than twenty years, Schaevitz® pressure transducers have been used in the most demanding steel mill applications around the world. In this environment, a pressure transducer must be able to survive pressure spikes (or hammering effects), voltage spikes and EMI/RFI interference, while maintaining excellent output performance.

The Schaevitz® P981 family meets these demanding requirements and more.

The P981 Series is offered with a variety of pressure ports, pressure restrictors, snubbers, bleed screws and electrical outputs specifications. These features make the P981 Series ideally suited for applications in de-scaling lines, temper mill and many other steel mill applications. Additionally, Schaevitz® Sensors provides customization of many of our pressure transducers, so if you do not see exactly what you are looking for, contact our application engineering department to discuss your requirements.

What's your extreme?

The Schaevitz® Sensors products covered in this catalog are standard designs to handle critical application requirements, such as:

- MIL, CE, IS, UL, FM, CSA, LCIE, and other approval rating standards
- High pressure
- Submersible
- Nuclear hardened
- Extreme temperature
- Humidity and condensation
- Salt water and other corrosives/fluids
- Altitude
- Shock and vibration

If you do not find a product in this catalog that meets your need, please feel free to contact our application engineering department by phone or through our website to discuss your application.

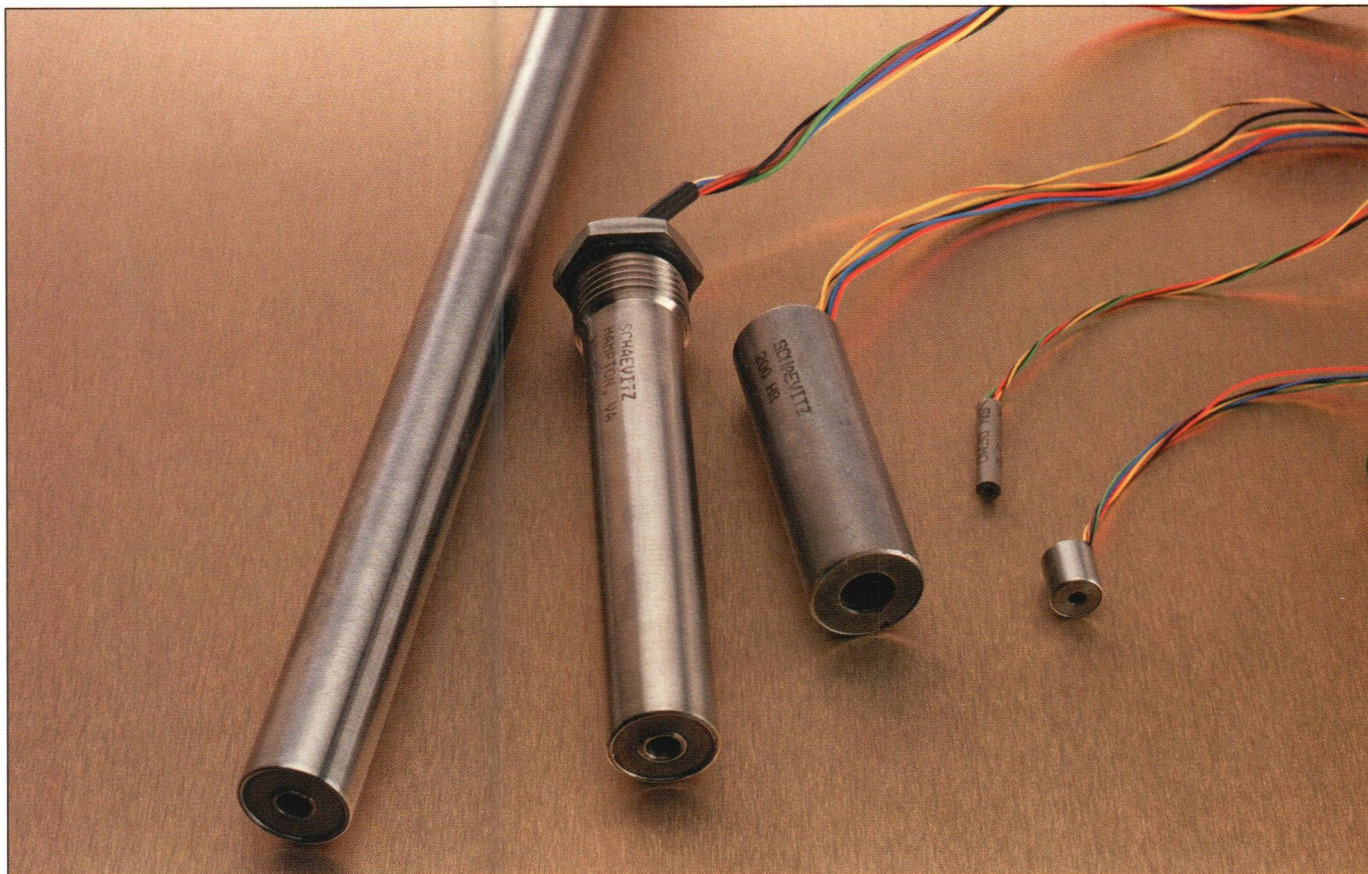
Linear
Displacement
LVDTs



Linear
Variable
Differential
Transformers

Schaevitz® LVDT Technology

LVDT Functional Advantages and Operation Principles



An LVDT is an electromechanical transducer that produces an electrical output proportional to the displacement of a separate movable core.

The LVDT has many commendable features that make it useful for a wide variety of applications.

Frictionless Measurement

Ordinarily, there is no physical contact between the movable core and coil structure, which means that the LVDT is a frictionless device. This permits its use in critical measurements that can tolerate the addition of the low-mass core, but cannot tolerate friction loading. Two examples of such applications are dynamic deflection or vibration tests of delicate materials and tensile or creep tests on fibers or other highly elastic materials.

Infinite Mechanical Life

The absence of friction and contact between the coil and core of an LVDT means that there is nothing to wear out. This gives an LVDT essentially infinite mechanical life. This is a paramount requirement in applications such as the fatigue-life testing of materials and structures. The infinite mechanical life is also important in high-reliability mechanisms and systems found in aircraft, missiles, space vehicles and critical industrial equipment.

Infinite Resolution

The frictionless operation of the LVDT combined with the induction principle by which the LVDT functions gives the LVDT two outstanding characteristics. The first is truly infinite resolution. This means that the LVDT can respond to even the most minute motion of the core and produce an output. The readability of the external electronics represents the only limitation on resolution.

Null Repeatability

The inherent symmetry of the LVDT construction produces the other feature—null repeatability. The null position of an LVDT is extremely stable and repeatable. Thus the LVDT can be used as an excellent null position indicator in high-gain closed-loop control systems. It is also useful in ratio systems where the resultant output is proportional to two independent variables at null.

Cross-Axis Rejection

An LVDT is predominantly sensitive to the effects of axial core motion and relatively insensitive to radial core motion. This means the LVDT can be used in applications where the core does not move in an exact straight line; as, for example, when an LVDT is coupled to the end of a bourdon tube to measure pressure.

Some of these features are unique to the LVDT and are not available in any other transducer (element). These features arise from the basic fact that the LVDT is an electrical transformer with a separable non-contacting core.

Extreme Ruggedness

The combination of the materials used in an LVDT and the techniques used for assembling them result in an extremely rugged and durable transducer. This rugged construction permits an LVDT to continue to function even after exposure to substantial shock loads and high vibration levels often encountered in industrial environments.

Core and Coil Separation

The separation between LVDT core and LVDT coil permits the isolation of media such as pressurized, corrosive, or caustic fluids from the coil assembly by a non-magnetic barrier interposed between the core and the inside of the coil. It also makes the hermetic sealing of the coil assembly possible and eliminates the need for a dynamic seal on the moving member. Only a static seal is necessary to seal the coil assembly within the pressurized system.

Environmental Compatibility

An LVDT is one of the few transducers that can operate in a variety of hostile environments. For example, a hermetically sealed LVDT is constructed of materials such as stainless steel that can be exposed to corrosive liquids or vapors.

Certain situations call for LVDT operation in extreme environments. In some cases, for example, it is necessary to operate at cryogenic temperatures, such as at the surface of liquid nitrogen. Another example of extreme conditions includes LVDTs that operate within the primary containment vessel of a nuclear reactor at temperatures ranging up to 1,000°F (550°C) coupled with radiation of 10^{11} Rads and/or neutron flux of 3×10^{20} NVT total integrated flux. Yet another extreme environment includes LVDTs that operate in pressurized fluids up to 3000 psi (210 bars).

Suitably designed LVDTs can be used in various combinations of these hostile environments. One key factor to keep in mind, however, is that unlike most other LVDTs working within their operating limits (which have virtually unlimited lives), LVDTs for hostile environments do have lives limited by their operating conditions which must be considered on a case by case basis.

Input/Output Isolation

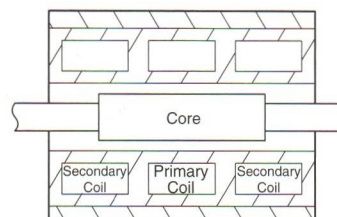
The fact that the LVDT is a transformer means that there is complete isolation between excitation input (primary) and output (secondaries). This makes an LVDT an effective analog computing element without the need for buffer amplifiers. It also facilitates the isolation of the signal ground from excitation ground in high-performance measurement and control loops.

New Captive Core Option

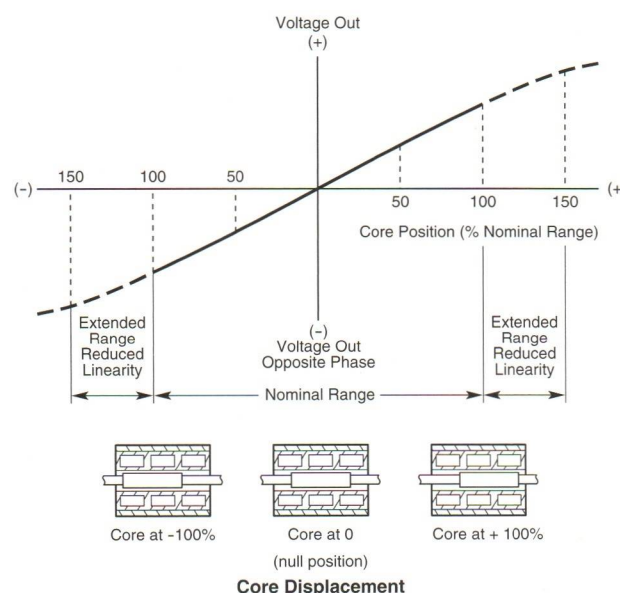
Many Schaevitz® LVDTs feature a captive core design that greatly simplifies installation. The design utilizes a core rod and bearing assembly that is captured and guided within the LVDT providing low friction travel throughout the stroke length. The assembly incorporates two Delrin bearings on the core rod traveling through the stainless steel boreliner. A bronze bearing on the front end utilizes a self-aligning feature to accommodate lateral LVDT movement during operation. The core rod and bearing assembly are field replaceable.

How LVDTs Works

The LVDT is an electromechanical device that produces an electrical output proportional to the displacement of a separate movable core. It consists of a primary coil and two secondary coils symmetrically spaced on a cylindrical form. A free-moving, rod-shaped magnetic core inside the coil assembly provides a path for the magnetic flux linking the coils.



When the primary coil is energized by an external AC source, voltages are induced in the two secondary coils. These are connected series opposing so the two voltages are of opposite polarity. Therefore, the net output of the transducer is the difference between these voltages, which is zero when the core is at the center or null position. When the core is moved from the null position, the induced voltage in the coil toward which the core is moved increases, while the induced voltage in the opposite coil decreases. This action produces a differential voltage output that varies linearly with changes in core position. The phase of this output voltage changes abruptly by 180° as the core is moved from one side of null to the other. (The core must always be fully within the coil assembly during operation of the LVDT, otherwise gross non-linearity will occur.)



Schaevitz® LVDT Technology

LVDT Design and Construction

Stainless steel housing and end lids provide electrostatic and electromagnetic shielding

Vacuum and pressure impregnation with high-grade electrical varnish adds additional moisture proofing, thermal stability, and structural integrity to the coils

Housing is spun-swagged over end lids to produce tight seal

DC LVDTs incorporate a small, encapsulated carrier generator/signal conditioning module

Epoxy encapsulation assures proper heat transfer and bonding of coils to housing

High density, glass-filled polymer coil form has low moisture absorption and excellent thermal stability. Coil movement due to moisture breathing is eliminated

High permeability, nickel-iron hydrogen-annealed core for low harmonics, low null voltage, and high sensitivity

How a Schaevitz® LVDT is Constructed

There is an extremely wide variety of LVDT types, sizes, ranges, and physical configurations commercially available. This bulletin describes those which approach optimum design characteristics and satisfy the majority of user requirements.

Each series of Schaevitz® LVDTs represents the culmination of several decades of refinement in the application of electromagnetic principles as well as improved methods of construction. A primary design

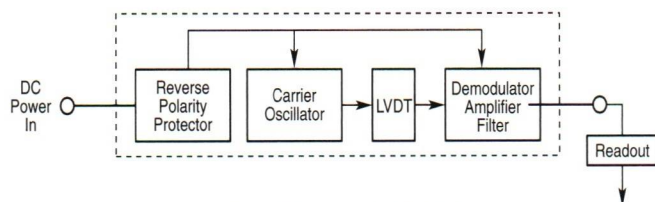
consideration has been the determination of a combination of windings which produces excellent linearity without compromising other desirable performance characteristics.

In recent years, the computer has played a vital role in the refinement of these construction techniques. In addition, state-of-the-art materials are continually replacing more traditional materials as they prove suitable for LVDT construction.

DC-Operated LVDTs

The DC-LVDT maintains all of the desirable characteristics of the AC-LVDT, but has the simplicity of DC operation. It is composed of two integral parts: an AC-LVDT and a carrier generator/signal conditioning module. Small, yet rugged, the carrier system eliminates most of the volume, weight, and cost of conventional external AC signal conditioning equipment. The self-contained LVDT operates from a simple DC power supply or, in some cases, a battery. Virtually any DC meter can be employed as readout.

As can be seen from the block diagram below, the Schaevitz® DC LVDT module operates from a DC power source. It is protected against damage resulting from accidental misconnection to the wrong polarity of the power supply. The DC input power is routed to the carrier oscillator and to the signal amplifiers.



Block Diagram of DC LVDT

The carrier oscillator produces a constant amplitude sine wave to excite the primary of the LVDT. The sinusoidal excitation provides superior performance to earlier square wave oscillator designs.

With continuing advances in technology, the DC LVDT is further refined to produce a high performance, economical unit. These transducers contain all the electronics necessary to excite the LVDT, and to demodulate and amplify the analog output signal. The entire signal conditioning module, mounted in tandem with the LVDT, adds only slightly to the overall length of the transducer.

Position Transmitter Systems

In addition to the full line of AC and DC operated LVDTs, Schaevitz® offers several 2-wire current loop position transmitter systems. These loop powered transmitters are especially suited to valve and other position indication applications for the process industry. These systems consist of an LVDT position sensor with matching electronics (either built in or remotely located) to provide 4-20 mA output into a 2-wire current loop.

Position transmitter systems are packaged in rugged, splash proof or hermetic housings, designed for the most adverse installations. Their design is particularly suitable for use in valve position feedback and other process industry remote sensing applications in which AC power is not readily available to operate external signal conditioning.



The CTS Transmitter System is a 2-wire current loop, position transmitter system that combines an LVDT with matching electronics to provide 4-20 mA output.

Schaevitz® LVDT Technology

Selection Overview

Design Considerations

Linear Range

Linear range is the distance the LVDT is designed to operate and meet factory specifications.

Method of Measurement

Most Schaevitz® LVDTs are designed to be mechanically linked to the object being measured. If a physical connection between the transducer and object is undesirable, consider Schaevitz® spring loaded and non-contacting gage heads or our new non-contacting laser sensors.



New Product

Our new captive core option simplifies installation by eliminating alignment difficulties. The option is available with the HCA, DC-EC, DC-SE, HCD and HCT Series.

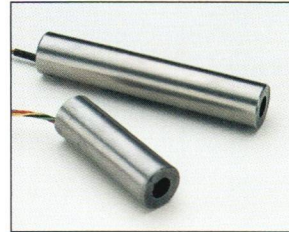


New Product

The DC-SE offers single-ended input and output for compatibility with unipolar analog-to-digital converters and PLCs.

AC-Operated LVDTs

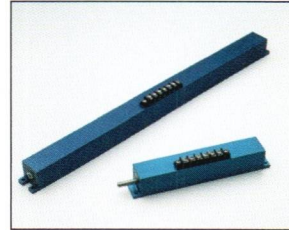
HR Series



Page 38

- AC operated
- Eleven models from $\pm 0.05"$ to $\pm 10.0"$ linear range
- Mild radiation resistance available
- $13/16"$ diameter housing

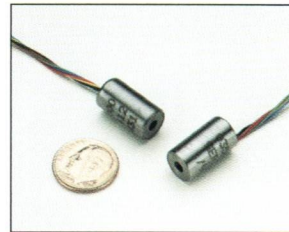
MP Series



Page 40

- AC operated
- Seven models from $\pm 0.5"$ to $\pm 10.0"$ linear range
- $1.25" \text{W} \times 1.25" \text{H}$ housing
- Flange mounting for easy installation

MHR Series



Page 42

- AC operated
- Sixteen models from $\pm 0.005"$ to $\pm 1.0"$ linear range
- Light weight, $7/64"$ diameter core
- $3/8"$ diameter housing

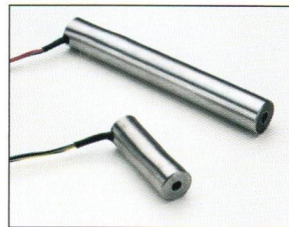
HCA Series



Page 44

- AC operated
- Nine models from $\pm 0.05"$ to $\pm 10.0"$ linear range
- Hermetically sealed
- $3/4"$ diameter housing
- Mild radiation resistance
- Captive core option

E Series



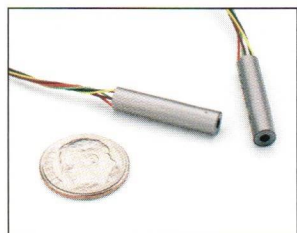
Page 46

- AC operated
- Low cost
- Six models from $\pm 0.100"$ to $\pm 2.00"$ linear range
- $3/4"$ diameter housing

Note: AC LVDTs are sold as components and as such, are not subject to regulation under current CE requirements.

AC-Operated LVDTs for Specialized Applications

XS-B Series



Page 48

- AC operated
- Two models from $\pm 0.100"$ to $\pm 0.250"$ linear range
- Miniature design $3/16"$ diameter housing
- Very low mass $1/16"$ diameter core

XS-C Series



Page 50

- AC operated
- Three models from $\pm 0.250"$ to $\pm 1.000"$ linear range
- High pressure sealed for operation at 3000 psi
- $3/4"$ diameter housing with $7/8-14$ UNF-2A thread for bulkhead mounting

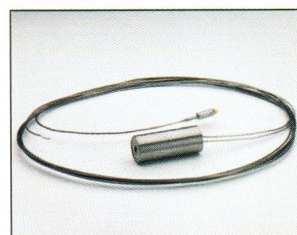
XS-D Series



Page 52

- AC operated
- Five models from $\pm 1.00"$ to $\pm 10.0"$ linear range
- Longest stroke to body length
- $13/16"$ diameter housing

XS-ZTR Series

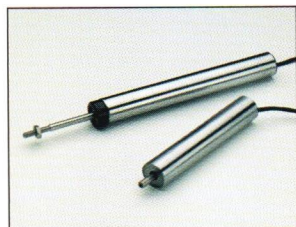


Page 54

- AC operated
- Four models from $\pm 0.100"$ to $\pm 1.000"$ linear range
- Radiation resistant— withstands total integrated neutron flux levels to 3×10^{20} NVT or 10^{11} rads gamma
- Withstands continuous operating temperatures of -320°F (-195°C) to $1,022^\circ\text{F}$ (550°C)
- $1"$ diameter housing; $3/16"$ diameter core

DC-Operated LVDTs

DC-EC Series



Page 56

- DC operated
- Nine models from $\pm 0.05"$ to $\pm 10.0"$ linear range
- Captive core option available
- CE compliant
- $3/4"$ diameter housing

DC-Operated LVDTs

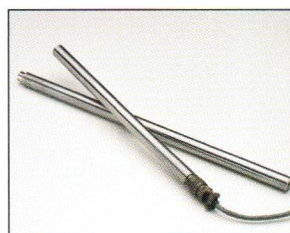
DC-SE Series



Page 58

- DC operated
- Single ended
- Nine models from 0 to $0.1"$ to 0 to $6.0"$ linear range
- Captive core option
- CE compliant
- $3/4"$ diameter housing

HCD Series

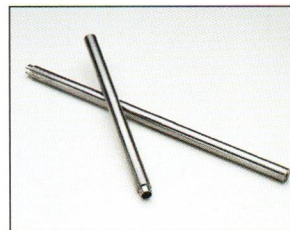


Page 60

- DC operated
- Nine models from $\pm 0.05"$ to $\pm 10.0"$ linear range
- Hermetically sealed
- Captive core option
- CE compliant
- $3/4"$ diameter housing

LVDT Transmitter Systems

HCT/HCT IS Series



Page 62

- 4-20 mA, 2-wire operation— HCT IS model intrinsically safe approved
- Six models from 0 to $\pm 0.25"$ to 0 to $\pm 10.0"$ linear range
- Self-contained electronics in a compact $3/4"$ diameter housing
- Hermetically sealed
- Captive core option

PTS Series



Page 66

- 4-20 mA, 2-wire operation
- Six models from 0 to $\pm 0.25"$ to 0 to $\pm 10.0"$ linear range
- Self-contained electronics
- Zero and span adjustments
- Rugged splashproof housing

CTS Series



Page 68

- 4-20 mA, 2-wire operation
- Seven models from 0 to $\pm 0.25"$ to 0 to $\pm 10.0"$ linear range
- Electronics mounted up to 25 feet from hermetically sealed LVDT
- Optional splashproof housing for electronics

SCHAEVITZ
SENSORS

HR Series

General Purpose LVDT

The high reliability HR Series of LVDTs is suitable for most general applications. The HR Series features a large core-to-bore clearance, high output voltage over a broad range of excitation frequencies, and a magnetic stainless steel case for electromagnetic and electrostatic shielding.

Features

- ☐ **Optimum performance for a majority of applications**
- ☐ **Large 1/16 inch radial core-to-bore clearance**
- ☐ **Calibration certificate supplied with all models**
- ☐ **Compatible with all Schaevitz® signal conditioners**
- ☐ **High temperature (220°C) and high pressure (vented case) available – consult factory**

Applications

- ☐ **General**

Options

- ☐ **5.0 kHz excitation frequency testing***
- ☐ **Metric thread core**
- ☐ **Guided core**
- ☐ **Small diameter/low mass core**
- ☐ **Mild radiation resistance (withstands 10¹² NVT total integrated flux; 10⁷ rads Gamma)**

* Performance and electrical specifications for alternative frequencies will differ from the standard specifications listed below which are based on a 2.5 kHz excitation frequency. Consult factory for further information.



Specifications

| | |
|-----------------------------|--|
| Input Voltage | 3 V rms (nominal) |
| Frequency Range | 400 Hz to 5 kHz |
| Operating Temperature Range | -65°F to 300°F (-55°C to 150°C) |
| Null Voltage | <0.5% full scale output |
| Shock Survival | 1,000 g for 11 msec |
| Vibration Tolerance | 20 g up to 2 kHz |
| Coil Form Material | High density, glass-filled polymer |
| Housing Material | AISI 400 series stainless steel |
| Lead Wires | 28 AWG, stranded copper, Teflon-insulated, 12 inches (300 mm) long (nominal) |

Performance and Electrical Specifications @ 2.5 kHz¹

| HR Series Model Number | Nominal Linear Range | | Linearity (±% full range) | | | | Sensitivity mV out/V in Per | | Impedance Ohms | | Phase Shift Degrees |
|------------------------|---|--------|---------------------------|------|-------|-------|-----------------------------|------|----------------|------|---------------------|
| | inches | mm | 50 | 100 | 125 | 150 | 0.001 in | mm | Pri | Sec | |
| 050 HR | ±0.050 | ±1.27 | 0.10 | 0.25 | 0.25 | 0.50 | 5.8 | 230 | 430 | 4000 | -1 |
| 100 HR | ±0.100 | ±2.54 | 0.10 | 0.25 | 0.25 | 0.50 | 4.2 | 165 | 1070 | 5000 | -5 |
| 200 HR | ±0.200 | ±5.08 | 0.10 | 0.25 | 0.25 | 0.50 | 2.5 | 91 | 1150 | 4000 | -4 |
| 300 HR | ±0.300 | ±7.62 | 0.10 | 0.25 | 0.35 | 0.50 | 1.3 | 51 | 1100 | 2700 | -11 |
| 500 HR | ±0.500 | ±12.70 | 0.15 | 0.25 | 0.35 | 0.75 | 0.7 | 25.6 | 460 | 375 | -1 |
| 1000 HR | ±1.00 | ±25.4 | 0.15 | 0.25 | 1.00 | 1.30* | 0.39 | 14.2 | 460 | 320 | -3 |
| 2000 HR | ±2.00 | ±50.8 | 0.15 | 0.25 | 0.50* | 1.00* | 0.23 | 8.3 | 330 | 330 | +5 |
| 3000 HR | ±3.00 | ±76.2 | 0.15 | 0.25 | 0.50* | 1.00* | 0.25 | 9.1 | 315 | 830 | +11 |
| 4000 HR | ±4.00 | ±101.6 | 0.15 | 0.25 | 0.50* | 1.00* | 0.20 | 7.1 | 275 | 550 | +1 |
| 5000 HR | ±5.00 | ±127.0 | 0.15 | 0.25 | 1.00* | n/r | 0.14 | 5.5 | 310 | 400 | +3 |
| 7500 HR | Now available — Contact factory for details | | | | | | | | | | |
| 10000 HR | ±10.0 | ±254 | 0.15 | 0.25 | 1.00* | n/r | 0.07 | 2.8 | 550 | 750 | -5 |

¹ All calibration is performed at room ambient temperature.

* Requires special reduced core length.

How to Order

Specify the HR Model followed by the desired option number(s) added together.

Ordering Example:

Model Number 050 HR-018 is an HR Series LVDT with a $\pm 0.05''$ range (050 HR), with 5 kHz testing (002), Metric thread core (006), and a guided core (010).

HR Model

050 HR
100 HR
200 HR
300 HR
500 HR
1000 HR
2000 HR
3000 HR
4000 HR
5000 HR
10000 HR

Options

Number Description

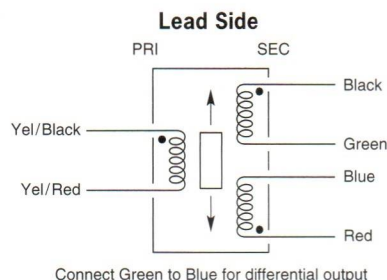
002 5.0 kHz Linearity Test¹
006 Metric Thread Core
010 Guided Core²
020 Small Diameter/Low Mass Core³
080 Radiation Resistance²

¹Available on models 050 HR, 100 HR, 200 HR, and 500 HR only.

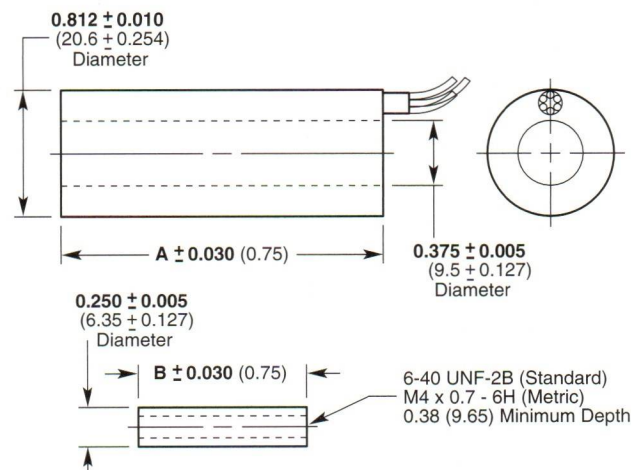
²Guided core and radiation resistance options cannot be ordered together.

³Available on models 050 HR - 500 HR only. Consult factory for mass, dimensions and thread size.

Wiring



Dimensions in (mm)



Mechanical Specifications

| HR Series Model Number | Weight | | | | Dimensions | | | |
|------------------------------|--------|-----|------|----|------------|-------|----------|-------|
| | Body | | Core | | A (Body) | | B (Core) | |
| | oz | gm | oz | gm | in | mm | in | mm |
| 050 HR | 1.13 | 32 | 0.41 | 4 | 1.13 | 28.7 | 0.80 | 20.3 |
| 100 HR | 1.69 | 48 | 0.21 | 6 | 1.81 | 46.0 | 1.30 | 33.0 |
| 200 HR | 1.93 | 60 | 0.28 | 8 | 2.50 | 63.5 | 1.65 | 41.9 |
| 300 HR | 2.72 | 77 | 0.35 | 10 | 3.22 | 81.8 | 1.95 | 49.5 |
| 500 HR | 3.85 | 109 | 0.64 | 18 | 5.50 | 139.7 | 3.45 | 87.6 |
| 1000 HR | 4.45 | 126 | 0.74 | 21 | 6.63 | 168.4 | 4.00 | 101.6 |
| 2000 HR | 5.93 | 168 | 0.95 | 27 | 10.00 | 254.0 | 5.30 | 134.6 |
| 3000 HR | 7.94 | 225 | 0.99 | 28 | 12.81 | 325.4 | 5.60 | 142.2 |
| 4000 HR | 10.41 | 295 | 1.27 | 36 | 15.64 | 397.3 | 7.00 | 177.8 |
| 5000 HR | 11.99 | 340 | 1.27 | 36 | 17.88 | 454.2 | 7.00 | 177.8 |
| 10000 HR | 20.56 | 580 | 1.52 | 43 | 30.84 | 783.3 | 8.50 | 215.9 |

MP Series

Hostile Industrial Environments LVDT

The MP series of LVDTs is suitable for heavy industrial use. Its coils are encapsulated in an anodized extruded aluminum housing, providing protection against electromagnetic and electrostatic interference. A heavy-duty terminal barrier strip replaces lead wires. A Teflon boreliner is standard equipment.

Features

- ❑ **Encapsulation guards against harsh industrial conditions**
- ❑ **Mounting flanges permit rapid installation**
- ❑ **Screw terminal wiring**
- ❑ **Calibration certificate supplied with all models**
- ❑ **Compatible with all Schaevitz® signal conditioners**

Applications

- ❑ **Industrial**

Options

- ❑ **5.0 kHz excitation frequency testing***
- ❑ **Metric thread core**
- ❑ **Small diameter/low mass core**

* Performance and electrical specifications for alternative frequencies will differ from the standard specifications listed below which are based on a 2.5 kHz excitation frequency. Consult factory for further information.



Specifications

| | |
|-----------------------------|------------------------------------|
| Input Voltage | 3 V rms (nominal) |
| Frequency Range | 400 Hz to 5 kHz |
| Operating Temperature Range | -65°F to 300°F (-55°C to 150°C) |
| Null Voltage | <0.5% full scale output |
| Shock Survival | 1,000 g for 11 msec |
| Vibration Tolerance | 20 g up to 2 kHz |
| Coil Form Material | High density, glass-filled polymer |
| Outer Housing Material | Anodized aluminum |
| Inner Housing Material | AISI 400 series stainless steel |
| Electrical Termination | 6-terminal barrier strip |

Performance and Electrical Specifications @ 2.5 kHz¹

| MP Series Model Number | Nominal Linear Range | | Linearity (±% full range) | | | | Sensitivity mV out/V in Per | | Impedance Ohms | | Phase Shift Degrees |
|------------------------|----------------------|--------|---------------------------|------|-------|-------|-----------------------------|------|----------------|-----|---------------------|
| | inches | mm | 50 | 100 | 125 | 150 | 0.001 in | mm | Pri | Sec | |
| 500 MP | ±0.500 | ±12.70 | 0.15 | 0.25 | 0.35 | 0.75 | 0.7 | 25.6 | 460 | 375 | -1 |
| 1000 MP | ±1.00 | ±25.4 | 0.25 | 0.25 | 1.00 | 1.30* | 0.39 | 14.2 | 460 | 320 | -3 |
| 2000 MP | ±2.00 | ±50.8 | 0.25 | 0.25 | 0.50* | 1.00* | 0.23 | 8.3 | 330 | 330 | +5 |
| 3000 MP | ±3.00 | ±76.2 | 0.15 | 0.25 | 0.50* | 1.00* | 0.25 | 9.1 | 315 | 830 | +11 |
| 4000 MP | ±4.00 | ±101.6 | 0.15 | 0.25 | 0.60* | 1.00* | 0.20 | 7.1 | 275 | 550 | +1 |
| 5000 MP | ±5.00 | ±127.0 | 0.15 | 0.25 | 1.00* | n/r | 0.14 | 5.5 | 310 | 400 | +3 |
| 10000 MP | ±10.0 | ±254 | 0.15 | 0.25 | 1.00* | n/r | 0.07 | 2.8 | 550 | 750 | -5 |

* Requires special reduced core length

¹All calibration is performed at room ambient temperature.

How to Order

Specify the MP Model followed by the desired option number(s) added together.

Ordering Example:

Model Number 500 MP-028 is an MP Series LVDT with a $\pm 0.500"$ range (500 MP), with 5 kHz testing (002), Metric thread core (006), and a small diameter core (020).

MP Model

500 MP
1000 MP
2000 MP
3000 MP
4000 MP
5000 MP
10000 MP

Options

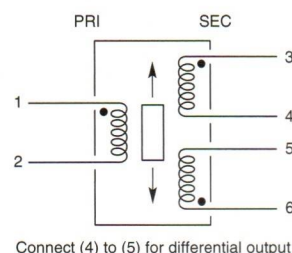
Number Description

002 5.0 kHz Linearity Test¹
006 Metric Thread Core
020 Small Diameter/Low Mass Core^{1&2}

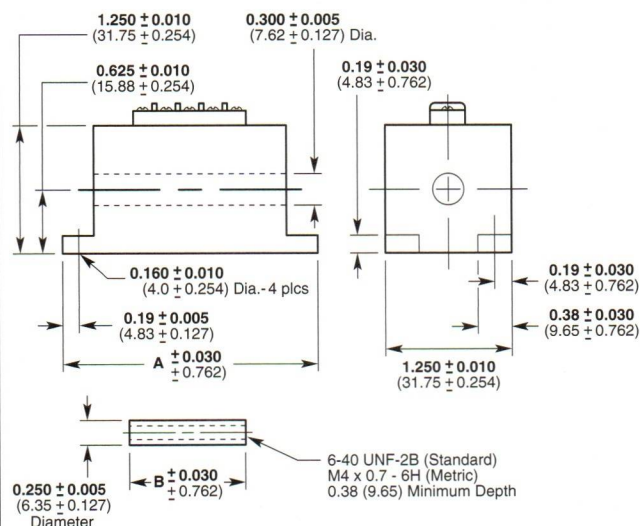
¹Available on model 500 MP only.

²Consult factory for mass, dimensions and thread size.

Wiring



Dimensions in (mm)



Mechanical Specifications

| MP Series Model Number | Weight | | Dimensions | | | | | |
|------------------------------|--------|------|------------|----|----------|-------|----------|-------|
| | | | Core | | A (Body) | | B (Core) | |
| | oz | gm | oz | gm | in | mm | in | mm |
| 500 MP | 12.36 | 350 | 0.64 | 18 | 6.50 | 165.1 | 3.45 | 87.6 |
| 1000 MP | 16.59 | 470 | 0.74 | 21 | 7.64 | 194.1 | 4.00 | 101.6 |
| 2000 MP | 21.00 | 595 | 0.95 | 27 | 11.01 | 279.7 | 5.30 | 134.6 |
| 3000 MP | 26.12 | 740 | 0.99 | 28 | 13.85 | 351.8 | 5.60 | 142.2 |
| 4000 MP | 31.77 | 900 | 1.27 | 36 | 16.68 | 423.7 | 7.00 | 177.8 |
| 5000 MP | 36.18 | 1025 | 1.27 | 36 | 18.92 | 480.6 | 7.00 | 177.8 |
| 10000 MP | 60.89 | 1725 | 1.52 | 43 | 31.90 | 810.3 | 8.50 | 215.9 |

MHR Series

Miniature LVDT

The MHR series of LVDTs is ideal for applications where excessive core weight could influence the motion of sensitive mechanisms. The lightweight core also helps minimize stresses and preserves the structural integrity of the core actuation assembly. High sensitivity results from close electrical coupling between coil and core. A magnetic stainless steel housing provides electromagnetic and electrostatic shielding.

Features

- ❑ *For applications where installation space or weight is limited*
- ❑ *Lightweight core*
- ❑ *Calibration certificate supplied with all models*
- ❑ *Compatible with all Schaevitz® signal conditioners*
- ❑ *High temperature (220°C) and high pressure (vented case) available – consult factory*

Applications

- ❑ *Sensitive, lightweight devices*

Options

- ❑ *Alternative 5.0 and 10.0 kHz excitation frequency testing**
- ❑ *Metric thread core*

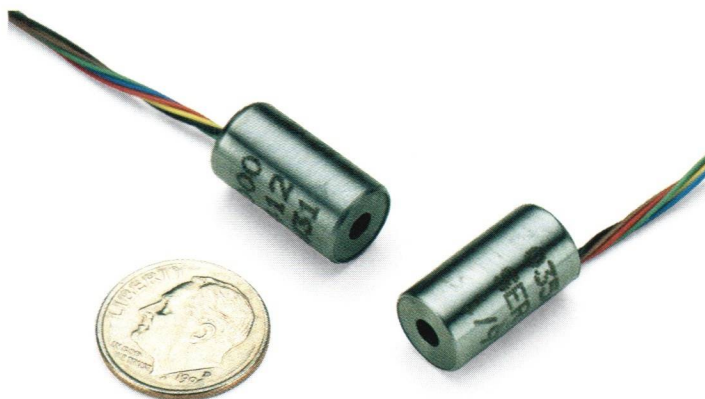
* Performance and electrical specifications for alternative frequencies will differ from the standard specifications listed below which are based on a 10 kHz excitation frequency. Consult factory for further information.

Performance and Electrical Specifications @ 10 kHz¹ (recommended)

| MHR Series Model Number | Nominal Linear Range | | Linearity (±% full range) | | | | Sensitivity mV out/V in Per | | Impedance Ohms | | Phase Shift Degrees |
|-------------------------------|-------------------------|--------|---------------------------|------|------|------|--------------------------------|-----|-------------------|-----|---------------------------|
| | inches | mm | 50 | 100 | 125 | 150 | 0.001 in | mm | Pri | Sec | |
| 005 MHR | ±0.005 | ±0.13 | 0.20 | 0.25 | 0.30 | 0.40 | 8.70 | 342 | 84 | 302 | +38 |
| 010 MHR | ±0.010 | ±0.25 | 0.10 | 0.25 | 0.35 | 0.35 | 6.05 | 238 | 165 | 300 | +20 |
| 025 MHR | ±0.025 | ±0.64 | 0.15 | 0.25 | 0.25 | 0.30 | 8.10 | 319 | 238 | 485 | +15 |
| 050 MHR | ±0.050 | ±1.27 | 0.15 | 0.25 | 0.35 | 0.50 | 3.15 | 124 | 419 | 154 | +8 |
| 100 MHR | ±0.100 | ±2.54 | 0.15 | 0.25 | 0.25 | 0.30 | 2.80 | 110 | 400 | 200 | +5 |
| 250 MHR | ±0.250 | ±6.35 | 0.15 | 0.25 | 0.35 | 0.50 | 2.07 | 86 | 345 | 420 | +7 |
| 500 MHR | ±0.500 | ±12.70 | 0.15 | 0.25 | 0.30 | 0.75 | 1.96 | 77 | 264 | 810 | +4 |
| 1000 MHR | ±1.000 | ±25.40 | 0.20 | 0.25 | 0.50 | — | 0.77 | 30 | 155 | 450 | -1 |

Performance and Electrical Specifications @ 2.5 kHz¹

| MHR Series Model Number | Nominal Linear Range | | Linearity (±% full range) | | | | Sensitivity mV out/V in Per | | Impedance Ohms | | Phase Shift Degrees |
|-------------------------------|-------------------------|--------|---------------------------|------|------|------|--------------------------------|-----|-------------------|-----|---------------------------|
| | inches | mm | 50 | 100 | 125 | 150 | 0.001 in | mm | Pri | Sec | |
| 005 MHR | ±0.005 | ±0.13 | 0.20 | 0.25 | 0.30 | 0.40 | 3.14 | 124 | 59 | 260 | +73 |
| 010 MHR | ±0.010 | ±0.25 | 0.10 | 0.25 | 0.35 | 0.35 | 3.29 | 129 | 78 | 192 | +39 |
| 025 MHR | ±0.025 | ±0.64 | 0.15 | 0.25 | 0.25 | 0.30 | 4.36 | 172 | 116 | 286 | +38 |
| 050 MHR | ±0.050 | ±1.27 | 0.15 | 0.25 | 0.35 | 0.50 | 2.55 | 100 | 141 | 90 | +36 |
| 100 MHR | ±0.100 | ±2.54 | 0.15 | 0.25 | 0.25 | 0.30 | 2.40 | 94 | 135 | 125 | +30 |
| 250 MHR | ±0.250 | ±6.35 | 0.15 | 0.25 | 0.35 | 0.50 | 1.73 | 68 | 147 | 268 | +29 |
| 500 MHR | ±0.500 | ±12.70 | 0.15 | 0.25 | 0.30 | 0.75 | 1.60 | 67 | 145 | 445 | +19 |
| 1000 MHR | ±1.000 | ±25.40 | 0.20 | 0.25 | 0.50 | — | 0.70 | 27 | 100 | 370 | +6 |



Specifications

| | |
|-----------------------------|--|
| Input Voltage | 3 V rms (nominal) |
| Frequency Range | 2 kHz to 20 kHz |
| Operating Temperature Range | -65°F to 300°F (-55°C to 150°C) |
| Null Voltage | <0.5% full scale output |
| Shock Survival | 1,000 g for 11 msec |
| Vibration Tolerance | 20 g up to 2 kHz |
| Coil Form Material | High density, glass-filled polymer |
| Housing Material | AISI 400 series stainless steel |
| Lead Wires | 32 AWG, stranded copper, Teflon-insulated, 12 inches (300 mm) long (nominal) |

How to Order

Specify the MHR Model followed by the desired option number(s) added together.

Ordering Example:

Model Number 050 MHR-009 is an MHR Series LVDT with a ± 0.05 " range (050 MHR), with the 10 kHz testing option (003), Metric thread core (006).

MHR Model

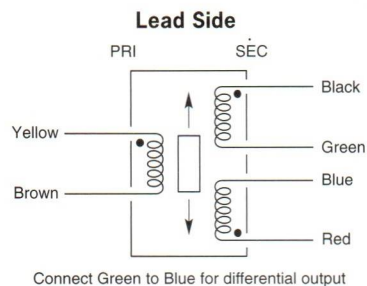
005 MHR
010 MHR
025 MHR
050 MHR
100 MHR
250 MHR
500 MHR
1000 MHR

Options

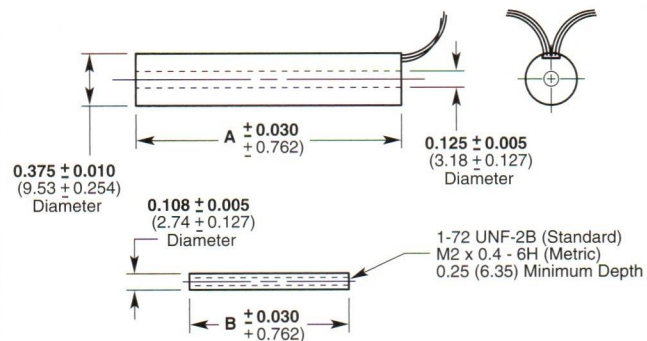
Number Description

002 5.0 kHz Linearity Test
003 10 kHz Linearity Test
006 Metric Thread Core

Wiring



Dimensions in (mm)



Mechanical Specifications

| MHR Series Model Number | Body | | Core | | Dimensions | | | |
|-------------------------------|------|----|-------|-----|------------|-------|----------|------|
| | | | | | A (Body) | | B (Core) | |
| | oz | gm | oz | gm | in | mm | in | mm |
| 005 MHR | 0.07 | 2 | 0.004 | 0.1 | 0.38 | 9.7 | 0.18 | 4.6 |
| 010 MHR | 0.11 | 3 | 0.007 | 0.2 | 0.54 | 13.7 | 0.23 | 5.8 |
| 025 MHR | 0.18 | 5 | 0.016 | 0.4 | 0.66 | 16.8 | 0.40 | 10.2 |
| 050 MHR | 0.21 | 6 | 0.016 | 0.4 | 0.80 | 20.3 | 0.50 | 12.7 |
| 100 MHR | 0.21 | 6 | 0.025 | 0.5 | 1.00 | 25.4 | 0.62 | 15.7 |
| 250 MHR | 0.32 | 9 | 0.032 | 0.9 | 1.85 | 47.0 | 1.12 | 28.4 |
| 500 MHR | 0.60 | 17 | 0.056 | 1.6 | 3.30 | 83.8 | 2.00 | 50.8 |
| 1000 MHR | 0.92 | 26 | 0.088 | 2.5 | 5.60 | 142.2 | 3.00 | 76.2 |

HCA Series

Hermetically Sealed LVDT

HCA series LVDTs are tungsten-inert gas (TIG) welded to form a hermetic seal that is impervious to dirt, water, steam and corrosive liquids and vapors. They feature a glass-sealed, MS-type connector, but do not permit through-bore operation. (A pin connector version – HPA series – allows the core and core rod to pass through the unit.) All exposed surfaces are stainless steel, including the boreliner and connector shell. Units can withstand external pressure up to 1,000 psi (70 bars). Double magnetic shielding resists external magnetic influences.

Features

- ☐ **Hermetically sealed welded housing suitable for hostile environments**
- ☐ **Connector termination**
- ☐ **Calibration certificate supplied with all models**
- ☐ **Compatible with Schaevitz® signal conditioners**
- ☐ **High temperature (220°C) available – consult factory**

Applications

- ☐ **Harsh industrial environments– submersible with appropriate connector**

Options

- ☐ **5.0 and 10.0 kHz excitation frequency testing***
- ☐ **Metric thread core**
- ☐ **Guided core**
- ☐ **Small diameter/low mass core**
- ☐ **Mild radiation resistance (withstands 10^{12} NVT total integrated flux; 10^7 rads Gamma)**
- ☐ **See page 72 for connector and cable options.**
- ☐ **Captive core option for convenient installation**

Performance and Electrical Specifications @ 2.5 kHz¹

| HCA Series Model Number | Nominal Linear Range | | Linearity (±% full range) | | | | Sensitivity mV out/V in Per | | Impedance Ohms | | Phase Shift Degrees |
|-------------------------|----------------------|--------|---------------------------|------|-------|-------|-----------------------------|-----|----------------|------|---------------------|
| | inches | mm | 50 | 100 | 125 | 150 | 0.001 in | mm | Pri | Sec | |
| 050 HCA | ±0.050 | ±1.27 | 0.20 | 0.25 | 0.25 | 0.50 | 4.2 | 165 | 430 | 950 | +6 |
| 125 HCA | ±0.125 | ±3.17 | 0.20 | 0.25 | 0.25 | 0.50 | 2.4 | 95 | 1710 | 1820 | +5 |
| 250 HCA | ±0.250 | ±6.35 | 0.20 | 0.25 | 0.30 | 0.50 | 1.6 | 63 | 800 | 940 | +5 |
| 500 HCA | ±0.500 | ±12.70 | 0.20 | 0.25 | 0.30 | 0.55 | 1.1 | 44 | 900 | 1150 | +2 |
| 1000 HCA | ±1.000 | ±25.40 | 0.20 | 0.25 | 0.35 | 0.55* | 0.84 | 34 | 900 | 2100 | +1 |
| 2000 HCA | ±2.000 | ±50.80 | 0.20 | 0.25 | 0.40* | 0.70* | 0.34 | 14 | 525 | 535 | -1 |
| 3000 HCA | ±3.000 | ±76.20 | 0.20 | 0.25 | 0.50* | 1.00* | 0.20 | 8.0 | 930 | 1040 | +1 |
| 5000 HCA | ±5.000 | ±127.0 | 0.20 | 0.25 | 0.80* | n/r | 0.16 | 6.4 | 1200 | 1640 | -5 |
| 10000 HCA | ±10.00 | ±254 | 0.20 | 0.25 | 0.90* | n/r | 0.13 | 5.0 | 930 | 3000 | -6 |

¹ All calibration is performed at room ambient temperature.

* Requires special reduced core length



Specifications

| | |
|-----------------------------|------------------------------------|
| Input Voltage | 3 V rms (nominal) |
| Frequency Range | 400 Hz to 10 kHz |
| Operating Temperature Range | -65°F to 300°F (-55°C to 150°C) |
| Null Voltage | <0.5% full scale output |
| Shock Survival | 1,000 g for 11 msec |
| Vibration Tolerance | 20 g up to 2 kHz |
| Coil Form Material | High density, glass-filled polymer |
| Housing Material | AISI 400 series stainless steel |
| Electrical Termination | 6-pin connector |

* Performance and electrical specifications for alternative frequencies will differ from the standard specifications listed below which are based on a 2.5 kHz excitation frequency. Consult factory for further information.

How to Order

Specify the HCA Model followed by the desired option number(s) added together.

Ordering Example:

Model Number 050 HCA-019 is an HCA Series LVDT with a $\pm 0.05"$ range (050 HCA), with 10 kHz testing (003), Metric thread core (006), and a guided core (010).

HCA Model

050 HCA
125 HCA
250 HCA
500 HCA
1000 HCA
2000 HCA
3000 HCA
5000 HCA
10000 HCA

Options

| Number | Description |
|--------|---|
| 002 | 5.0 kHz Linearity Test ¹ |
| 003 | 10 kHz Linearity Test ¹ |
| 006 | Metric Thread Core |
| 010 | Guided Core |
| 020 | Small Diameter/Low Mass Core ^{1&2} |
| 080 | Radiation Resistance |
| 200 | Captive Core ³ |

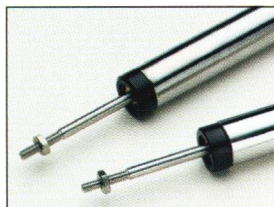
¹Available on models 050 HCA, 125 HCA, 250 HCA, and 500 HCA only.

²Consult factory for mass, dimensions and thread size.

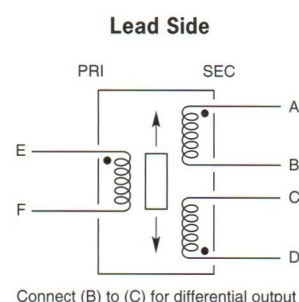
³Available on 050 HCA through 3000 HCA models only.

New Captive Core Option!

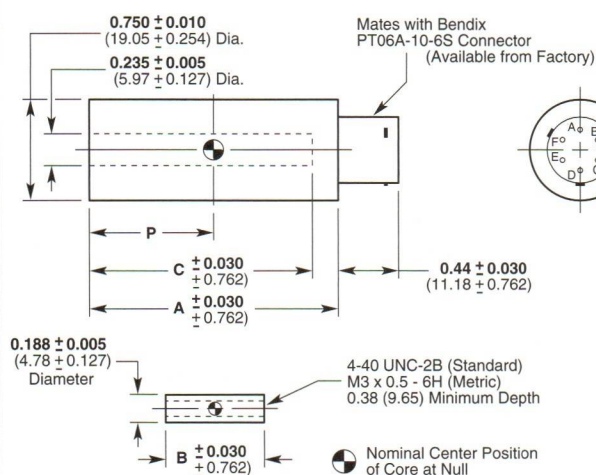
The HCA features a captive core design that greatly simplifies installation. The design utilizes a core rod and bearing assembly that is captured and guided within the LVDT providing low friction travel throughout the stroke length. The assembly incorporates two Delrin bearings on the core rod traveling through the stainless steel boreliner. A bronze bearing on the front end utilizes a self-aligning feature to accommodate lateral LVDT movement during operation. The core rod and bearing assembly are field replaceable. **See page 70 for specifications.**



Wiring



Dimensions in (mm)



Mechanical Specifications

| HCA Series | | Weight | | Dimensions | | | | | | | | | |
|--------------|-------|--------|------|------------|-------|----------|-------|-------|-------|-------|-------|-------|----|
| Model Number | Body | | Core | A (Body) | | B (Core) | | C | | P | | | |
| | oz | gm | oz | gm | in | mm | in | mm | in | mm | in | mm | mm |
| 050 HCA | 1.20 | 34 | 0.07 | 2 | 1.66 | 42.2 | 0.59 | 15.0 | 1.50 | 38.1 | 0.55 | 14.0 | |
| 125 HCA | 1.73 | 49 | 0.11 | 3 | 2.50 | 63.5 | 1.10 | 27.9 | 1.91 | 48.5 | 0.96 | 24.4 | |
| 250 HCA | 2.22 | 63 | 0.14 | 4 | 3.36 | 85.3 | 1.80 | 45.7 | 2.77 | 70.4 | 1.39 | 35.3 | |
| 500 HCA | 2.93 | 83 | 0.28 | 8 | 5.05 | 128.3 | 3.00 | 76.2 | 4.46 | 113.3 | 2.23 | 56.6 | |
| 1000 HCA | 5.22 | 148 | 0.39 | 11 | 7.29 | 185.2 | 3.80 | 96.5 | 6.72 | 170.7 | 3.32 | 84.3 | |
| 2000 HCA | 5.65 | 160 | 0.46 | 13 | 10.68 | 271.3 | 5.30 | 134.6 | 10.20 | 259.1 | 5.05 | 128.3 | |
| 3000 HCA | 8.33 | 236 | 0.49 | 14 | 15.76 | 400.3 | 6.20 | 157.5 | 15.17 | 385.3 | 7.59 | 192.8 | |
| 5000 HCA | 10.31 | 292 | 0.60 | 17 | 19.70 | 500.4 | 6.20 | 157.5 | 19.12 | 485.6 | 9.56 | 242.8 | |
| 10000 HCA | 18.57 | 526 | 0.85 | 24 | 33.82 | 859.0 | 12.00 | 304.8 | 33.23 | 844.1 | 16.61 | 421.9 | |

E Series

Economical LVDT

The economical E series of LVDTs satisfies numerous applications where LVDT performance and reliability are desired, but where budgets are limited. Linearity is 0.5% of full-range for all units except long-stroke models. The E series is particularly suitable for moderate operating temperatures. Its rugged construction will resist the shocks and vibrations encountered in most industrial applications. The E series is housed in magnetic stainless steel for protection against electromagnetic and electrostatic interference.

Features

- ☐ Customary LVDT performance at minimal cost
- ☐ Magnetically shielded case
- ☐ Compatible with all Schaevitz® signal conditioners

Applications

- ☐ Moderate operating temperatures

Options

- ☐ Metric thread core

* Performance and electrical specifications for alternative frequencies will differ from the standard specifications listed below which are based on a 2.5 kHz excitation frequency. Consult factory for further information.



Specifications

| | |
|-----------------------------|--|
| Input Voltage | 3 V rms (nominal) |
| Frequency Range | 50 Hz to 10 kHz |
| Operating Temperature Range | -65°F to 200°F (-55°C to 95°C) |
| Null Voltage | <1.0% full scale output |
| Shock Survival | 500 g for 11 msec |
| Vibration Tolerance | 20 g up to 2 kHz |
| Coil Form Material | High density, glass-filled polymer |
| Housing Material | AISI 400 series stainless steel |
| Lead Wires | 28 AWG, stranded copper, Teflon-insulated, 12 inches (300 mm) long (nominal) |

Performance and Electrical Specifications @ 2.5 kHz¹

| E Series Model Number | Nominal Linear Range | | Linearity (±% full range) | Sensitivity mV out/V in Per | | Impedance Ohms | | Phase Shift Degrees |
|-----------------------|----------------------|--------|------------------------------|--------------------------------|----|-------------------|------|------------------------|
| | inches | mm | | 0.001 in | mm | Pri | Sec | |
| E 100 | ±0.100 | ±2.54 | 0.5 | 2.4 | 96 | 660 | 960 | -3 |
| E 200 | ±0.200 | ±5.08 | 0.5 | 1.57 | 63 | 970 | 1010 | -5 |
| E 300 | ±0.300 | ±7.62 | 0.5 | 1.2 | 48 | 960 | 1005 | -8.5 |
| E 500 | ±0.500 | ±12.70 | 0.5 | 0.68 | 29 | 408 | 162 | +6 |
| E 1000 | ±1.00 | ±25.4 | 0.5 | 0.76 | 30 | 525 | 690 | +3.7 |
| E 2000 | ±2.00 | ±50.8 | 1.0 | 0.46 | 18 | 535 | 875 | 0 |

¹All calibration is performed at room ambient temperature.

How to Order

Specify the E Model followed by the desired option number(s) added together.

Ordering Example:

Model Number E 100-006 is an E Series LVDT with a $\pm 0.10"$ range (E 100), and a Metric thread core (006).

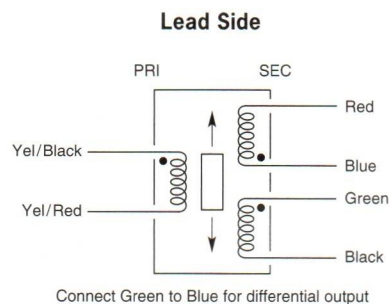
E Model

E 100
E 200
E 300
E 400
E 500
E 1000
E 2000

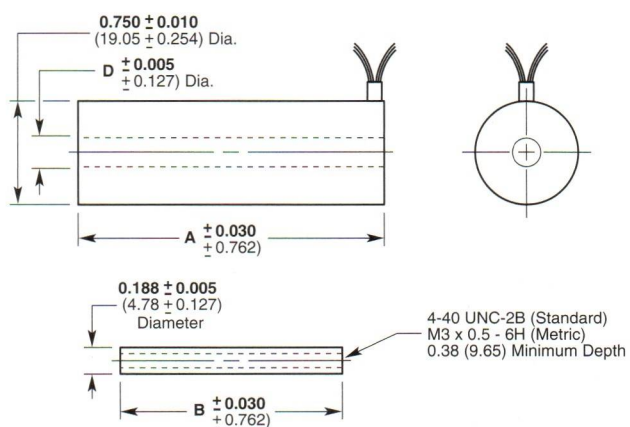
Options

| Number | Description |
|--------|--------------------|
| 006 | Metric Thread Core |

Wiring



Dimensions in (mm)



Mechanical Specifications

| E Series Model Number | Body | | Weight | | Core | | A (Body) | | Dimensions B (Core) | | D (Bore) | |
|-----------------------------|------|-----|--------|-----|------|----|----------|-------|------------------------|-------|----------|------|
| | oz | gm | oz | gm | oz | gm | in | mm | in | mm | in | mm |
| E 100 | 1.09 | 31 | 0.12 | 3.4 | | | 1.75 | 44.5 | 1.25 | 31.8 | 0.236 | 6.00 |
| E 200 | 1.27 | 36 | 0.13 | 3.8 | | | 2.25 | 57.2 | 1.48 | 37.6 | 0.236 | 6.00 |
| E 300 | 1.59 | 45 | 0.15 | 4.3 | | | 2.77 | 70.4 | 1.63 | 41.4 | 0.236 | 6.00 |
| E 500 | 1.98 | 56 | 0.30 | 8.4 | | | 4.56 | 115.8 | 3.00 | 76.2 | 0.210 | 5.33 |
| E 1000 | 2.44 | 69 | 0.39 | 11 | | | 7.00 | 177.8 | 3.80 | 96.5 | 0.210 | 5.33 |
| E 2000 | 4.49 | 127 | 0.60 | 17 | | | 10.50 | 266.7 | 6.20 | 157.5 | 0.210 | 5.33 |

XS-B Series

Sub-Miniature LVDT

The XS-B series was designed for micro applications. It is particularly well suited for multi-point measurement of small components. Core weight is virtually negligible. Manufacturing requires extremely sophisticated assembly techniques. Coils are wound from hair-thin wire. Lead-wire bonding and other exacting operations are performed by highly skilled specialists with binocular microscopes. Housing provides magnetic shielding.

Features

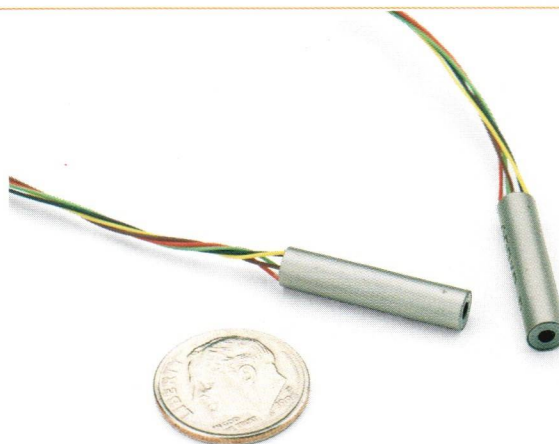
- ❑ *Sophisticated manufacturing processes insure quality*
- ❑ *Low mass core*
- ❑ *Threaded mount (Metric) available for 100 XS-BG*
- ❑ *Calibration certificate supplied with all models*

Applications

- ❑ *Micro applications, such as miniature gageheads and servomechanisms*
- ❑ *Ideal for multi-point measurement of small components*
- ❑ *Recommended where small size is the overwhelming requirement*

Options

- ❑ *See page 72 for XS-BG connector information*



XS-B Specifications

| | |
|---------------------------|--|
| Input Voltage | 1 V rms (maximum) |
| Frequency Range | 2.5 kHz to 20 kHz |
| Operating Temperature ... | -65°F to 300°F |
| Range | (-55°C to 150°C) |
| Null Voltage | <1.0% full scale output |
| Shock Survival | 1,000 g for 11 msec |
| Vibration Tolerance | 20 g up to 2 kHz |
| Coil Form Material | Laminated glass epoxy |
| Housing Material | AISI 400 series magnetic stainless steel |
| Lead Wires | 36 AWG, stranded copper, Teflon-insulated, 12 inches (300 mm) long (nominal) |

XS-BG Specifications

| | |
|---------------------------|---|
| Input Voltage | 3.5 V rms at 5.0 kHz (nom) |
| Linearity | ±0.2% of full range max |
| Sensitivity | 5.0 – 5.5 mV/V/.001" |
| Null Voltage | 5.0 mV (max) |
| Phase Shift | 3.0° ±3° |
| Primary Impedance | 960 ohms |
| Secondary Impedance | 2150 ohms |
| Operating Temp. Range .. | -40°F to 160°F (-40°C to 70°C) |
| Cable | 6.5 feet (2 meters), 32 AWG stranded, PTFE insulated, shielded polyurethane jacket, 6 conductor |
| Cable Exit | Axial standard; adaptor provided allows for radial exit |

Performance and Electrical Specifications

| Series Model Number | Nominal Linear Range | | Linearity ±% full range | | Sensitivity mV out/V in Per | | Impedance Ohms | | Phase Shift |
|------------------------|----------------------|------|---|------|-----------------------------|----|----------------|-----|-------------|
| | inches | mm | 50 | 100 | 0.001 in | mm | Pri | Sec | Degrees |
| 099 XS-B ¹ | ±0.100 | ±2.4 | 0.30 | 0.50 | 1.5 | 60 | 30 | 48 | +50 |
| 249 XS-B ¹ | ±0.250 | ±6.4 | 0.20 | 0.50 | 1.4 | 56 | 135 | 320 | +36 |
| 100 XS-BG ² | ±0.100 | ±2.4 | See XS-BG Electrical Specifications chart above | | | | | | |

¹At 2.5 kHz. All calibration is performed at room ambient temperature.

²At 5.0 kHz. All calibration is performed at room ambient temperature.

AC-Operated

XS-C Series

High-Pressure Sealed LVDT

The XS-C series satisfies those applications involving measurement and control in pressure-sealed chambers, e.g., hydraulic actuators and pressure vessels where bulkhead mounting is permitted. It is a sealed, heavy-walled LVDT suitable for operating pressures up to 3000 psi (210 bars), and proof pressures up to 4500 psi (315 bars). The XS-C's TIG-welded stainless steel housing is highly resistant to corrosive environments. Internal magnetic and electrostatic shielding render the XS-C insensitive to external magnetic influences. For operating pressures and temperatures above 3000 psi (210 bars) and +300°F (+150°C), and for applications involving total immersion including leadwires, consult the factory.

Features

- ❑ **Suitable for operating pressures up to 3000 psi (210 bars)**
- ❑ **Bulkhead mounting permits measurement and control in pressure-sealed chambers**
- ❑ **Calibration certificate supplied with all models**
- ❑ **Compatible with all Schaevitz® signal conditioners**

Applications

- ❑ **Hydraulic actuators and other pressurized vessels**

Options

- ❑ **Metric thread core**



Specifications

| | |
|---------------------------|--|
| Input Voltage | 3 V rms (nominal) |
| Frequency Range | 400 Hz to 5 kHz |
| Operating Temperature ... | -65°F to 300°F |
| Range | (-55°C to 150°C) |
| Null Voltage | <0.5% full scale output |
| Shock Survival | 1,000 g for 11 msec |
| Vibration Tolerance | 20 g up to 2 kHz |
| Coil Form Material | High density glass-filled polymer or laminated glass epoxy |
| Housing Material | AISI 304 series stainless steel |
| Lead Wires | 28 AWG, stranded copper, Teflon-insulated, 12 inches (300 mm) long (nominal) |

* Performance and electrical specifications for alternative frequencies will differ from the standard specifications listed below which are based on a 2.5 kHz excitation frequency. Consult factory for further information.

Performance and Electrical Specifications @ 2.5 kHz¹

| XS-C Series Model | Nominal Linear Range | | Linearity ±% full range | | Sensitivity mV out/V in Per | | Impedance Ohms | | Phase Shift |
|-------------------|----------------------|-------|-------------------------|------|-----------------------------|----|----------------|------|-------------|
| | inches | mm | 50 | 100 | 0.001 in | mm | Pri | Sec | Degrees |
| 249 XS-C | ±0.250 | ±6.35 | 0.20 | 0.25 | 1.7 | 68 | 800 | 940 | +5 |
| 499 XS-C | ±0.500 | ±12.7 | 0.20 | 0.25 | 1.0 | 40 | 938 | 1130 | +2 |
| 999 XS-C | ±1.000 | ±25.4 | 0.20 | 0.25 | 0.8 | 32 | 770 | 1400 | -1 |

¹All calibration is performed at room ambient temperature.

XS-C Series LVDT

High-Pressure Sealed to 3000 psi
Bulkhead Mounting
AC-Operated

How to Order

Specify the XS-C Model followed by the option number (if desired).

Ordering Example:

Model Number 249 XS-C-006 is an XS-C Series LVDT with a $\pm 0.250''$ range (249 XS-C), with a Metric thread core (006).

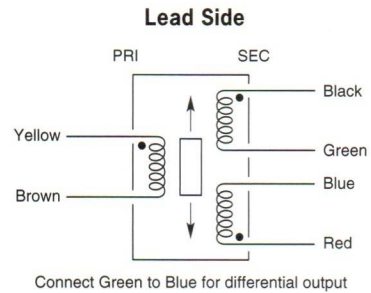
XS-C Model

249 XS-C
499 XS-C
999 XS-C

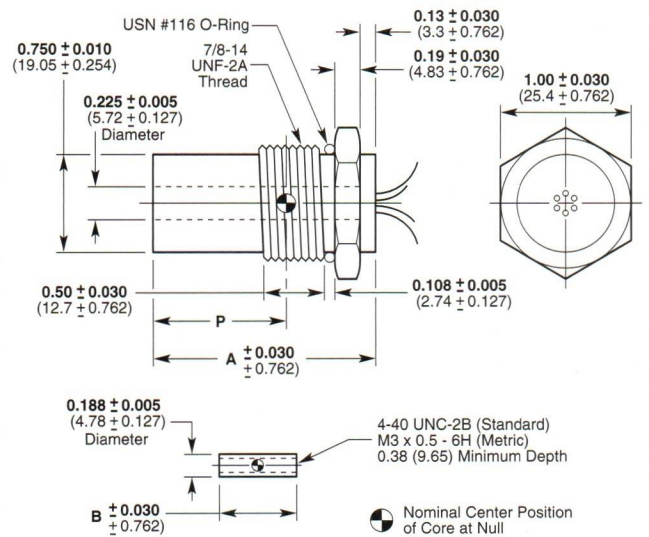
Options

| Number | Description |
|--------|--------------------|
| 006 | Metric Thread Core |

Wiring



Dimensions in (mm)



Mechanical Specifications

| XS-C Series Model Number | Weight | | | | Dimensions | | | | | |
|--------------------------------|--------|-----|------|------|------------|-------|----------|------|------|------|
| | Body | | Core | | A (Body) | | B (Core) | | P | |
| | oz | gm | oz | gm | in | mm | in | mm | in | mm |
| 249 XS-C | 3.88 | 110 | 0.12 | 3.4 | 2.93 | 74.4 | 1.8 | 45.7 | 1.39 | 35.3 |
| 499 XS-C | 4.62 | 131 | 0.30 | 8.4 | 4.63 | 117.6 | 3.0 | 76.2 | 2.23 | 56.6 |
| 999 XS-C | 6.04 | 171 | 0.37 | 10.6 | 7.88 | 200.1 | 3.8 | 96.5 | 3.18 | 80.8 |

XS-D Series

Long Stroke-to-Body Length LVDT

The XS-D series is particularly well suited for measuring relatively large displacements, but where installation space is limited. The XS-D has a substantially greater displacement range than standard LVDTs but without the accompanying increase in body length and weight. Special winding techniques permit linear range measurements up to 80 percent of the XS-D's housing length.

In cramped servo mechanisms, linear potentiometers are traditionally used because of their shorter length. However, the XS-D series LVDT will readily fit in such restricted space applications. In addition, LVDTs are superior to linear potentiometers, particularly in high-vibration environments. For example, dither, used to prevent static friction in servo systems, will rapidly consume a linear potentiometer. The LVDT, being a contactless device, experiences no wear whatsoever. Since a linear potentiometer's output impedance varies with wiper position, its linearity is impaired when a significant load is applied. Unlike the linear potentiometer, the LVDT has a constant low output impedance. The 400 series stainless steel housing provides magnetic shielding.

Features

- ☐ **Displacement ranges up to 10"**
- ☐ **Weighs less than standard LVDTs having comparable displacement ranges**
- ☐ **80% of unit length is available for linear range measurements**
- ☐ **Calibration certificate supplied with all models**
- ☐ **Compatible with all Schaevitz® signal conditioners**

Applications

- ☐ **For applications where sensor installation length is restricted**
- ☐ **Ideal replacement for linear potentiometers**

Options

- ☐ **Metric thread core**



Specifications

| | |
|-----------------------------|--|
| Input Voltage | 3 V rms (nominal) |
| Frequency Range | 400 Hz to 3 kHz |
| Operating Temperature Range | -65°F to 300°F (-55°C to 150°C) |
| Null Voltage | <0.5% full scale output |
| Shock Survival | 1,000 g for 11 msec |
| Vibration Tolerance | 20 g up to 2 kHz |
| Coil Form Material | High density glass-filled polymer or laminated glass epoxy |
| Housing Material | AISI 400 series magnetic stainless steel |
| Lead Wires | 28 AWG, stranded copper, Teflon-insulated, 12 inches (300 mm) long (nominal) |

Performance and Electrical Specifications @ 2.5 kHz¹

| XS-D Series Model Number | Nominal Linear Range | | Linearity (±% full range) | Sensitivity mV out/V in Per | | Impedance Ohms | | Phase Shift Degrees |
|--------------------------|----------------------|--------|------------------------------|--------------------------------|-----|-------------------|-----|------------------------|
| | inches | mm | | 0.001 in | mm | Pri | Sec | |
| 1002 XS-D | ±1.000 | ±25.4 | 2.0 | 0.25 | 10 | 200 | 200 | +50 |
| 2002 XS-D | ±2.000 | ±50.8 | 2.0 | 0.18 | 7.2 | 454 | 390 | +22 |
| 3002 XS-D | ±3.000 | ±76.2 | 2.0 | 0.125 | 5.1 | 245 | 335 | -18 |
| 5002 XS-D | ±5.000 | ±127.0 | 2.0 | 0.14 | 5.5 | 280 | 250 | +24 |
| 10002 XS-D | ±10.0 | ±254 | 2.0 | 0.05 | 2.0 | 462 | 462 | 0 |

¹All calibration is performed at room ambient temperature.

XS-D Series LVDT

Long Stroke-to-Body Length
Displacement Range up to 20"
AC-Operated

How to Order

Specify the XS-D Model followed by the option number (if desired).

Ordering Example:

Model Number 5002 XS-D-006 is an XS-D Series LVDT with a ± 5.0 " range (5002 XS-D), with a Metric thread core (006).

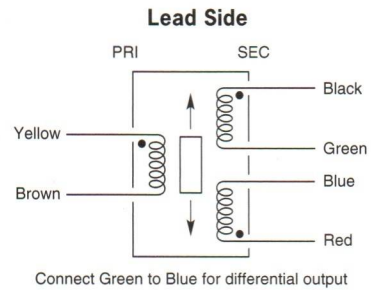
XS-D Model

1002 XS-D
2002 XS-D
3002 XS-D
5002 XS-D
10002 XS-D

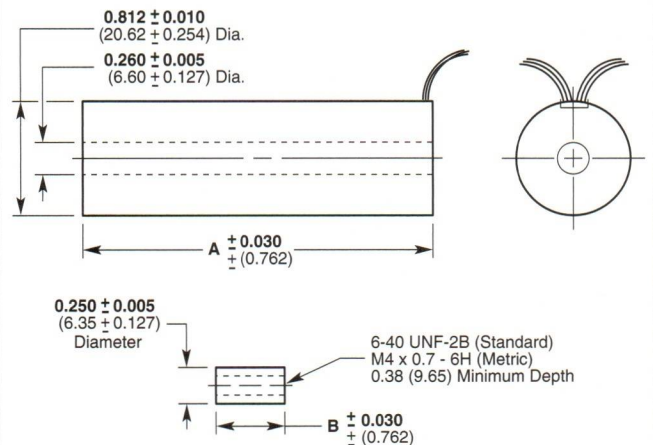
Options

| Number | Description |
|--------|--------------------|
| 006 | Metric Thread Core |

Wiring



Dimensions in (mm)



Mechanical Specifications

| XS-D Series Model Number | Weight | | | | Dimensions | | | |
|--------------------------------|--------|-----|------|------|------------|-------|----------|-------|
| | Body | | Core | | A (Body) | | B (Core) | |
| | oz | gm | oz | gm | in | mm | in | mm |
| 1002 XS-D | 2.29 | 65 | 0.09 | 2.5 | 2.50 | 63.5 | 0.45 | 11.4 |
| 2002 XS-D | 4.06 | 115 | 0.28 | 8.0 | 5.75 | 146.1 | 1.5 | 38.1 |
| 3002 XS-D | 4.94 | 140 | 0.24 | 6.8 | 7.50 | 190.5 | 1.3 | 33.1 |
| 5002 XS-D | 7.59 | 215 | 0.44 | 12.5 | 12.50 | 317.5 | 2.4 | 61.0 |
| 10002 XS-D | 16.59 | 470 | 0.88 | 23.0 | 25.00 | 635.0 | 4.0 | 101.6 |

XS-ZTR Series

Nuclear Radiation Resistant LVDT

The XS-ZTR series LVDT is designed for measuring displacement at very high and cryogenic temperatures. The XS-ZTR operates continuously at 550°C and will survive 650°C for several hours. The XS-ZTR is also designed to perform within specification after exposure to a total integrated flux of 10^{11} rads gamma or 3×10^{20} NVT.

The XS-ZTR is made exclusively from inorganic materials, principally metals and ceramics. Windings are of ceramic insulated precious metal alloys; joints are welded or brazed with high temperature alloys. Leads are sheathed in stainless steel. Conductors are typically nickel with magnesium oxide insulation. Materials are selected to have compatible expansion coefficients in order to minimize thermal stresses. Most inorganic insulations are hygroscopic so the entire coil assembly is weld sealed into a stainless steel shell. This process prevents moisture accumulation and insulation leakage. It also seals out hostile surrounding media while permitting the core to move freely. The cable can be terminated by a sealed header or connector when required.

For moderate temperature and radiation applications, consider the HR or HCA LVDTs (with 080 option), or the MHR series (with special order vented case).

Features

- ☐ **Withstands total integrated neutron flux levels to 3×10^{20} NVT**
- ☐ **Withstands total integrated radiation of 10^{11} rads or 10^9 gray**
- ☐ **Suitable for continuous operation from -320°F (-195°C) up to 1022°F (550°C)**
- ☐ **Survives non-operating temperatures up to 1200°F (650°C)**
- ☐ **Special temperature calibrations available**
- ☐ **Calibration certificates supplied with all models**

Applications

- ☐ **Nuclear reactor containment vessel bolt tension**
- ☐ **Cryogenic medicine**
- ☐ **Space research**
- ☐ **Jet engine gimbal position feedback**
- ☐ **Roll gap on steel hot strip and slabbing mills**

Options

- ☐ **Metric thread core**

Performance and Electrical Specifications @ 2.5 kHz¹

| XS-ZTR Series Model Number | Nominal Linear Range | | Linearity (±% full range) | Sensitivity mV out/V in Per | | Impedance Ohms | | Phase Shift Degrees |
|----------------------------|----------------------|-------|---------------------------|-----------------------------|----|----------------|-----|---------------------|
| | inches | mm | | 0.001 in | mm | Pri | Sec | |
| 100 XS-ZTR | ±0.100 | ±2.54 | 0.5 | 1.3 | 51 | 95 | 250 | -8 |
| 250 XS-ZTR | ±0.250 | ±6.35 | 0.5 | 0.3 | 12 | 100 | 80 | +20 |
| 500 XS-ZTR | ±0.500 | ±12.7 | 0.5 | 0.4 | 16 | 80 | 180 | +9 |
| 1000 XS-ZTR | ±1.000 | ±25.4 | 0.5 | 0.2 | 8 | 110 | 145 | +11 |



Radiation Resistance

Certain applications require resistance to a combination of gamma radiation, neutron radiation and high temperature. Before considering detailed specifications and suitability for a particular application a review of some working definitions and equivalents is in order:

- nvt = integrated flux or fluence
= neutron density x velocity x time
= $n/m^3 \times m/s \times s$
= n/m^2
- rad = radiation absorbed dose
= radiation that will deposit 100 ergs per gram
- $n/cm^2 = 4.17 \times 10^{-9}$ rads
- $n/cm^2 = 4.17 \times 10^{-7}$ ergs/gm
- 1 Gray (gy) = 100 rad absorbed dose
- 1 rad/hr = approximately 7×10^8 neutrons/ m^2s^2

All radiation produces some damage, therefore, the issue becomes how much radiation and what kind of radiation can an object sustain while maintaining its operation specification. At best, this can only be an estimate.

When radiant energy falls on an object, equal amounts of energy from different sources may result in greatly differing amounts of damage depending on the form of radiation, i.e. gamma rays, neutrons, etc. These different sources may also result in qualitatively different kinds of damage. One method to quantify these differences is to determine the rate of radiation that a unit can withstand without instantaneous and unacceptable damage. Another method is to determine the total integrated flux that can be absorbed before "wear-out" damage from radiation occurs. The distinction between rate of flux and total integrated flux must be kept clearly in mind.

There is no direct relationship between neutron fluence and gamma radiation. If we assume equal energy dissipation from differing sources, the energy absorbed by the unit will vary with its absorption cross section. If we try to equalize damage, there is even more uncertainty because of the qualitative differences of the damage caused by various forms of radiation.

How to Order

Specify the XS-ZTR Model followed by the option number (if desired).

Ordering Example:

Model Number 500 XS-ZTR-006 is an XS-ZTR Series LVDT with a ± 0.500 " range (500 XS-ZTR), with a Metric thread core (006).

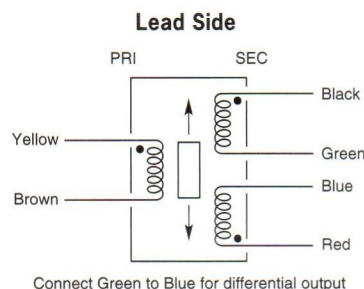
XS-ZTR Model Options

| 100 XS-ZTR | <table><tr><th>Number</th><th>Description</th></tr><tr><td>006</td><td>Metric Thread Core</td></tr></table> | Number | Description | 006 | Metric Thread Core |
|-------------|---|--------------------|-------------|-----|--------------------|
| Number | | Description | | | |
| 006 | | Metric Thread Core | | | |
| 250 XS-ZTR | | | | | |
| 500 XS-ZTR | | | | | |
| 1000 XS-ZTR | | | | | |
| 2000 XS-ZTR | | | | | |

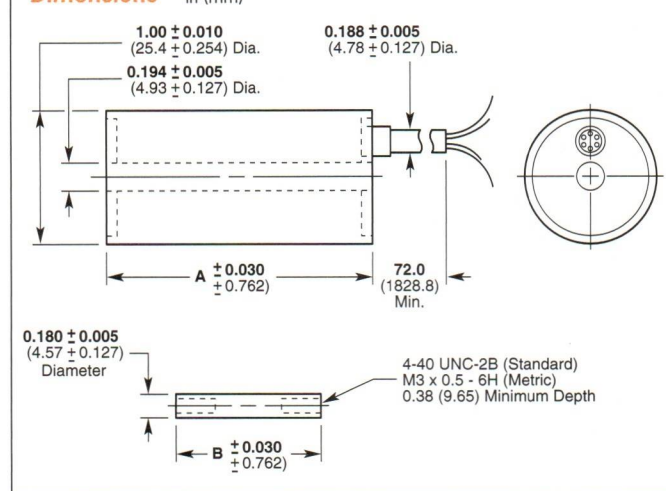
Specifications

| | |
|-----------------------|--|
| Input Voltage | 3 V rms (nominal) |
| Frequency Range | 400 Hz to 5,000 Hz |
| Operating Temperature | |
| Range | -320°F to +1022°F (-195°C to 550°C) |
| Survival Temperature | |
| Range | -450°F to +1200°F (-270°C to 650°C) |
| Null Voltage | <0.5% full scale output |
| Shock Survival | 10 g for 11 msec |
| Vibration Tolerance | 10 g up to 2 kHz |
| Coil Form Material | Ceramic |
| Housing Material | AISI 304 series stainless steel |
| Lead Wires | 28 AWG solid nickel, MgO insulated, 72 inches (180 cm) long (nominal): 3/16 inch (4.75 mm) diameter stainless steel sheath, 1/2 inch (12.5 mm) minimum bend radius |

Wiring



Dimensions in (mm)



Wiring

Standard termination is a multiple conductor 6-foot (1.8 m) long, 3/16 inch (4.75 mm) diameter swagged stainless steel cable. Other lengths and diameters are available on special order.

A frequently specified alternative termination is a pair of 2-conductor 1/16 inch (1.6 mm) diameter stainless steel sheathed cables. These are particularly suitable for applications where the cables are routed through an arduous path within the reactor.

Mechanical Specifications

| XS-ZTR Series | | | Weight | | Dimensions | | | |
|---------------|-------|-----|--------|------|------------|-------|----------|------|
| Model | Body* | | Core | | A (Body) | | B (Core) | |
| Number | oz | gm | oz | gm | in | mm | in | mm |
| 100 XS-ZTR | 2.29 | 65 | 0.09 | 2.5 | 2.51 | 63.8 | 1.35 | 34.3 |
| 250 XS-ZTR | 4.06 | 115 | 0.28 | 8.0 | 3.83 | 97.2 | 1.35 | 34.3 |
| 500 XS-ZTR | 4.94 | 140 | 0.24 | 6.8 | 5.00 | 127.0 | 3.00 | 76.2 |
| 1000 XS-ZTR | 7.59 | 215 | 0.44 | 12.5 | 6.90 | 175.3 | 3.40 | 86.4 |

* With 6-foot cable

DC-EC AccuSens™ Series

General Purpose LVDT

The DC-EC AccuSens™ Series incorporates a unique monolithic chip combined with a computer-designed AC LVDT to achieve premium performance.

The ratiometric design of the monolithic circuitry compensates for power supply deviations for continuously stable operation. Unaffected by input variations, the transducer provides highly accurate, repeatable measurement.

Innovative manufacturing techniques further enhance the AccuSens operation and cost efficiency. Micro-miniature components used in the construction of each unit are selected for maximum stability.

Vacuum encapsulation of all elements produces an assembly tolerant to shock, vibration and other forms of physical abuse. Double magnetic shielding protects against stray electrical fields.

Features

- ☐ **Linearity 0.25% of FS or better**
- ☐ **CE certified**
- ☐ **Integrated signal conditioning**
- ☐ **Rugged stainless steel construction**
- ☐ **Calibration certificates supplied with all models**

Applications

- ☐ **General**

Options

- ☐ **Metric thread core**
- ☐ **Captive core option for convenient installation**
- ☐ **Guided core**
- ☐ **Small diameter, low mass core**

Performance and Electrical Specifications¹

| DC-EC Series Model Number | Nominal Linear Range | | Scale Factor | | Response -3 dB Hz |
|---------------------------------|----------------------|-------|--------------|------|-------------------------|
| | inches | mm | V/inch | V/mm | |
| 050 DC-EC | ±0.050 | ±1.25 | 200.0 | 8.00 | 500 |
| 125 DC-EC | ±0.125 | ±3.0 | 80.0 | 3.20 | 500 |
| 250 DC-EC | ±0.250 | ±6.0 | 40.0 | 1.60 | 500 |
| 500 DC-EC | ±0.500 | ±12.5 | 20.0 | 0.80 | 200 |
| 1000 DC-EC | ±1.000 | ±25 | 10.0 | 0.40 | 200 |
| 2000 DC-EC | ±2.000 | ±50 | 5.0 | 0.20 | 200 |
| 3000 DC-EC | ±3.000 | ±75 | 3.3 | 0.13 | 200 |
| 5000 DC-EC | ±5.000 | ±125 | 2.0 | 0.08 | 200 |
| 10000 DC-EC | ±10.00 | ±250 | 1.0 | 0.04 | 200 |

¹All calibration is performed at room ambient temperature.



Specifications

| | |
|--|---|
| Input Voltage | ±15 VDC (nominal), ±25 mA |
| Operating Temperature Range | 32°F to 160°F (0°C to 70°C) |
| Survival Temperature Range | -65°F to 200°F (-55°C to 95°C) |
| Null Voltage | 0 VDC |
| Ripple | Less than 25 mV rms |
| Linearity | 0.25% full range |
| Stability | 0.125% full scale |
| Temperature—Coefficient of Scale Factor | 0.04%/°F (0.08%/°C) |
| Shock Survival | 250 g for 11 milliseconds |
| Vibration Tolerance | 10 g up to 2 kHz |
| Coil Form Material | High density, glass-filled polymer |
| Housing Material | AISI 400 series stainless steel |
| Cable | 4 conductor, 28 AWG, stranded copper with braided shield and polyurethane jacket, 1 meter |
| EMC | CE certified (The DC-EC series, when correctly installed, comply with the EMC Directive 89/336/EEC generic standards for residential commercial, light industrial and industrial environments.) |
| Output Impedance | Less than 1 ohm |

How to Order

Specify the DC-EC Model followed by the desired option number(s) added together.

Ordering Example:

Model Number 050 DC-EC-200 is an DC-EC Series LVDT with a ± 0.050 " range (050 DC-EC), with the captive core option (200).

DC-EC Model Options

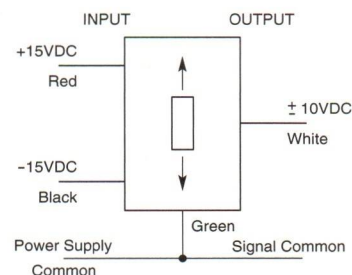
| DC-EC Model | Options |
|-------------|---|
| 050 DC-EC | Number Description |
| 125 DC-EC | 006 Metric Thread Core |
| 250 DC-EC | 010 Guided Core |
| 500 DC-EC | 020 Small Diameter, Low Mass Core ¹ |
| 1000 DC-EC | 200 Captive Core ² |
| 2000 DC-EC | ¹ Consult factory for mass, dimensions and thread size. |
| 3000 DC-EC | ² Available on 050 DC-EC through 3000 DC-EC models only. |
| 5000 DC-EC | |
| 10000 DC-EC | |

New Captive Core Option!

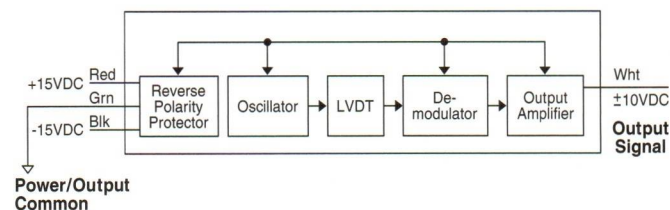
The DC-EC features a captive core design that greatly simplifies installation. The design utilizes a core rod and bearing assembly that is captured and guided within the LVDT providing low friction travel throughout the stroke length. The assembly incorporates two Delrin bearings on the core rod traveling through the stainless steel boreliner. A bronze bearing on the front end utilizes a self-aligning feature to accommodate lateral LVDT movement during operation. The core rod and bearing assembly are field replaceable. **See page 71 for specifications.**



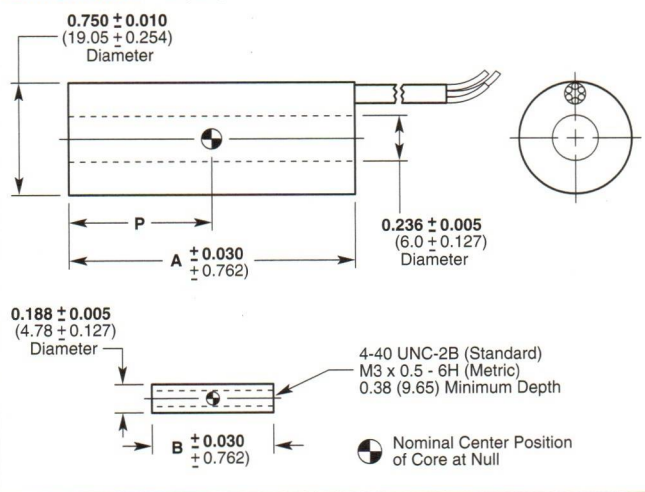
Wiring



Block Diagram



Dimensions in (mm)



Mechanical Specifications

| DC-EC Series | Weight | | | | Dimensions | | | | | | |
|--------------|--------------|-------|------|------|------------|-------|----------|-------|-------|-------|-------|
| | Body | | Core | | A (Body) | | B (Core) | | P | | |
| | Model Number | oz | gm | oz | gm | in | mm | in | mm | in | mm |
| 050 DC-EC | | 2.19 | 62 | 0.07 | 2 | 2.10 | 53.5 | 0.75 | 19.1 | 0.50 | 12.7 |
| 125 DC-EC | | 2.44 | 69 | 0.11 | 3 | 2.93 | 74.5 | 1.25 | 31.8 | 0.93 | 23.6 |
| 250 DC-EC | | 2.58 | 73 | 0.18 | 5 | 3.80 | 96.5 | 2.00 | 50.8 | 1.35 | 34.3 |
| 500 DC-EC | | 2.93 | 82 | 0.28 | 8 | 5.49 | 139.5 | 3.00 | 76.0 | 2.20 | 55.9 |
| 1000 DC-EC | | 4.24 | 120 | 0.35 | 10 | 7.75 | 196.9 | 3.80 | 96.5 | 3.18 | 80.8 |
| 2000 DC-EC | | 5.47 | 155 | 0.46 | 13 | 11.12 | 282.5 | 5.30 | 135.0 | 4.88 | 134.6 |
| 3000 DC-EC | | 9.39 | 266 | 0.49 | 14 | 16.32 | 414.5 | 6.20 | 157.5 | 7.55 | 191.8 |
| 5000 DC-EC | | 11.47 | 325 | 0.60 | 17 | 20.15 | 511.8 | 6.20 | 157.5 | 9.53 | 242.0 |
| 10000 DC-EC | | 15.71 | 445 | 0.85 | 24 | 35.38 | 898.5 | 12.00 | 305.0 | 16.58 | 421.1 |

DC-SE Series

General Purpose LVDT

The new Schaevitz® DC-SE series has been designed to meet today's requirements for operation from a single-ended power supply. The output is also single-ended over the full range displacement of the LVDT making the unit compatible with unipolar inputs on analog-to-digital converters and programmable logic controllers, etc.

The DC-SE design features internal regulation which provides immunity from line ripple and allows operation from an unregulated 8.5 to 28 VDC supply. The DC-SE current draw is 6 mA (typical), making remote or portable operation from batteries possible. The incorporation of a new high stability oscillator provides improved temperature stability, while the synchronous demodulator insures excellent noise rejection.

The electronics design uses surface mount technology to keep costs and size of the unit to a minimum. Built-in EMI/ESD protection and shielded cable allows operation in industrial environments. The DC-SE meets CE requirements.

Features

- ☐ **CE certified**
- ☐ **Operates from single-ended, unregulated 8.5–28 VDC supply**
- ☐ **0–5 VDC or 1–6 VDC output voltage, depending on customer hook up**
- ☐ **Low power consumption**
- ☐ **200 Hz frequency response**
- ☐ **1 meter shielded cable**
- ☐ **Calibration certificates supplied with all models**

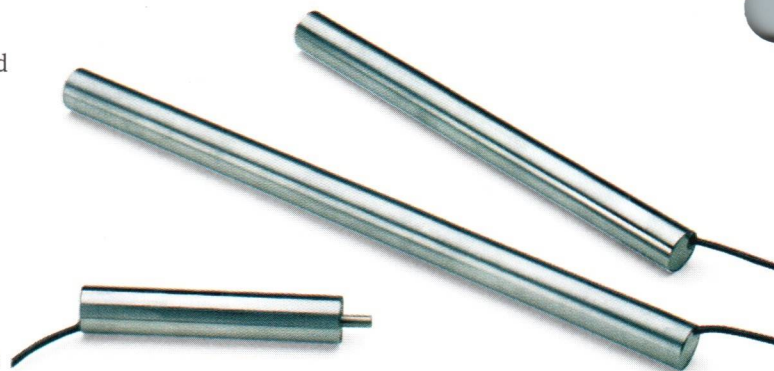
Applications

- ☐ **Positioning sensing feedback, test labs, ram guide and platen position feedback**

Options

- ☐ **Metric thread core**
- ☐ **Guided core**
- ☐ **Small diameter/low mass core**
- ☐ **Captive core option for convenient installation**

Performance and Electrical Specifications¹



Specifications

| | |
|---|---|
| Input Voltage | +8.5 to +28 VDC |
| Input Current | <10 mA (6 mA typical) |
| Line Regulation | <1mV/V (0.2mV/V typical) |
| Operating Temperature Range | -13°F to 185°F (-25°C to 85°C) |
| Storage Temperature Range | -65°F to +200°F (-55°C to 95°C) |
| Output Voltage | 0–5 VDC (4 wire), 1–6 VDC (3 wire) |
| Ripple and Noise | Less than 10 mV rms |
| Linearity | 0.25% full range |
| Stability | 0.125% full scale |
| Temperature—Coefficient of Scale Factor | 0.025%/°F (0.05%/°C) max |
| Shock Survival | 250 g for 11 milliseconds |
| Vibration Tolerance | 10 g up to 2 kHz |
| Housing Material | AISI 400 series stainless steel |
| Cable | 4 conductor, 28 AWG stranded copper with braided shield and polyurethane jacket, 1 meter. |
| EMC | CE certified (The DC-SE series, when correctly installed, comply with the EMC Directive 89/336/EEC generic standards for residential commercial, light industrial and industrial environments.) |
| Output Impedance | Less than 1 ohm |

| DC-SE Series Model Number | Nominal Linear Range | | Scale Factor | | Response |
|---------------------------------|----------------------|----------|--------------|------|-------------|
| | inches | mm | V/inch | V/mm | -3 dB Hz |
| 100 DC-SE | 0 – 0.100 | 0 – 2.5 | 50 | 2.00 | 200 |
| 250 DC-SE | 0 – 0.250 | 0 – 6.25 | 20 | 0.80 | 200 |
| 500 DC-SE | 0 – 0.500 | 0 – 12.5 | 10 | 0.40 | 200 |
| 1000 DC-SE | 0 – 1.000 | 0 – 25 | 5 | 0.20 | 200 |
| 2000 DC-SE | 0 – 2.000 | 0 – 50 | 2.5 | 0.10 | 200 |
| 4000 DC-SE | 0 – 4.000 | 0 – 100 | 1.25 | 0.05 | 200 |
| 6000 DC-SE | 0 – 6.000 | 0 – 150 | 0.83 | 0.03 | 200 |

How to Order

Specify the DC-SE Model followed by the desired option number(s) added together.

Ordering Example:

Model Number 250 DC-SE-200 is an DC-SE Series LVDT with a 0.250" range with the captive core option (200).

DC-SE Model

Options

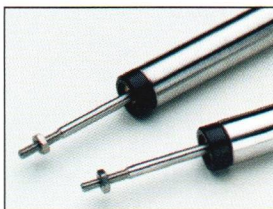
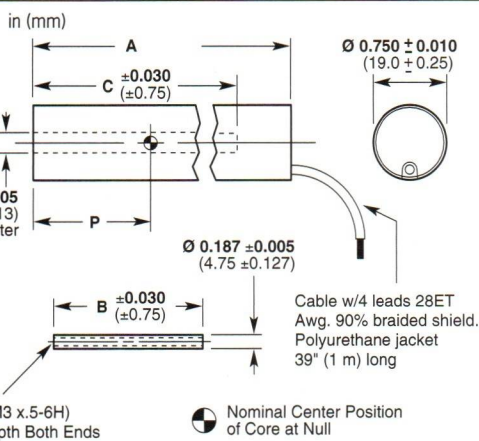
100 DC-SE
250 DC-SE
500 DC-SE
1000 DC-SE
2000 DC-SE
4000 DC-SE
6000 DC-SE

Number Description

006 Metric Thread Core
010 Guided Core
020 Small Diameter, Low Mass Core¹
200 Captive Core

¹ Consult factory for mass, dimensions and thread size.

Dimensions



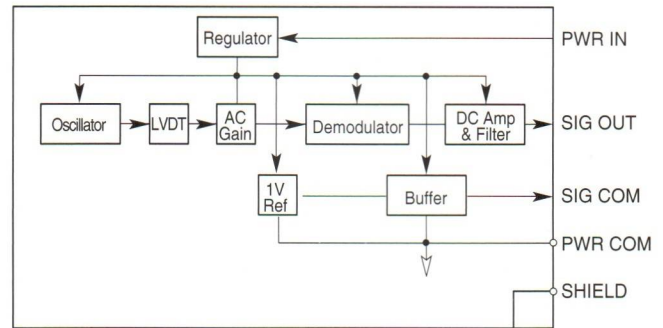
New Captive Core Option!

The DC-SE features a captive core design that greatly simplifies installation. The design utilizes a core rod and bearing assembly that is captured and guided within the LVDT providing low friction travel throughout the stroke length. The assembly incorporates two Delrin bearings on the core rod traveling through the stainless steel boreliner. A bronze bearing on the front end utilizes a self-aligning feature to accommodate lateral LVDT movement during operation. The core rod and bearing assembly are field replaceable. **See page 71 for specifications.**

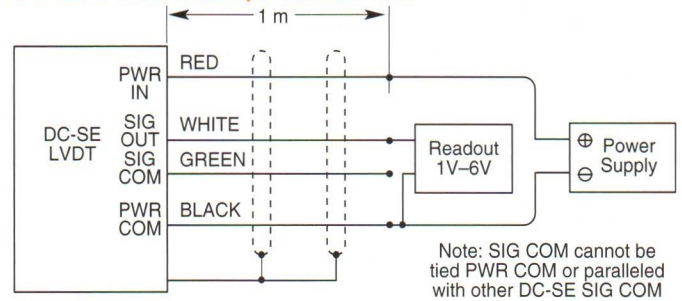
Mechanical Specifications

| DC-SE Series | | Weight | | Dimensions | | | | | | | | | |
|--------------|-------|--------|-------|------------|----------|-------|------|-------|-------|-------|------|-------|--|
| Model | Body | Core | | A (Body) | B (Core) | C | P | | | | | | |
| Number | oz | gm | oz | gm | in | mm | in | mm | in | mm | in | mm | |
| 100 DC-SE | 2.54 | 72 | 0.035 | 1 | 3.51 | 89.2 | 0.59 | 14.9 | 1.21 | 30.7 | 0.51 | 13.0 | |
| 250 DC-SE | 3.21 | 91 | 0.11 | 3 | 4.36 | 110.7 | 1.10 | 27.9 | 2.06 | 52.2 | 0.93 | 23.6 | |
| 500 DC-SE | 3.39 | 96 | 0.18 | 5 | 5.20 | 132.1 | 1.80 | 45.7 | 2.91 | 73.8 | 1.35 | 34.3 | |
| 1000 DC-SE | 4.38 | 124 | 0.28 | 8 | 6.89 | 175.0 | 3.00 | 76.2 | 4.59 | 116.7 | 2.20 | 55.9 | |
| 2000 DC-SE | 6.25 | 177 | 0.35 | 10 | 8.87 | 225.3 | 3.80 | 96.5 | 6.57 | 166.8 | 3.19 | 81.0 | |
| 4000 DC-SE | 8.33 | 236 | 0.53 | 15 | 12.25 | 311.2 | 5.30 | 134.6 | 9.95 | 252.8 | 4.88 | 124.0 | |
| 6000 DC-SE | 10.48 | 297 | 0.64 | 18 | 17.30 | 439.4 | 6.20 | 157.5 | 15.06 | 382.5 | 7.56 | 192.0 | |

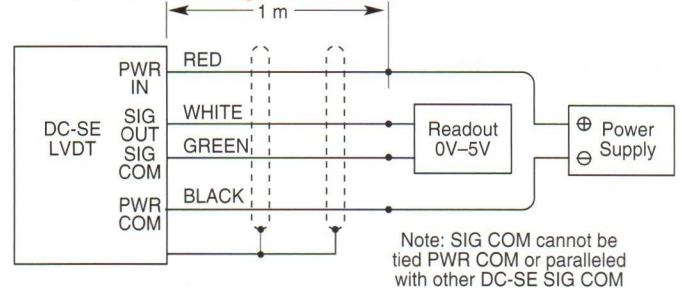
DC-SE Block Diagram



DC-SE 3-Wire Hookup: 1 to 6V Out



DC-SE 4-Wire Hookup: 0 to 5V Out



HCD Series

Hermetically Sealed

HCD series LVDTs are impervious to dirt, water, steam spray and most corrosives. Tungsten inert gas (TIG) welding provides hermetic sealing that is free from oxidation-producing faults that may cause leakage. They have been qualified at pressures up to 1000 psi (70 bars) and are suitable for numerous high-pressure applications. They are terminated with a glass-sealed, MS-type terminal connector. The connector prohibits the core from passing completely through the coil assembly. HCD units have double magnetic shielding that makes them insensitive to external magnetic influences.

Features

- ❑ *Hermetically sealed by TIG*
- ❑ *CE compliant*
- ❑ *Glass-sealed MS-type connector*
- ❑ *Calibration certificate supplied with all models*

Applications

- ❑ *Harsh industrial environments*
- ❑ *Ideal for pressure installations up to 1,000 psi*
- ❑ *Submersible with appropriate connector*

Options

- ❑ *Captive core option for convenient installation*
- ❑ *Metric thread core*
- ❑ *Guided core*
- ❑ *Small diameter, low mass core*
- ❑ *See accessories section for power supply, connector and cable options, page 72.*

Specifications

| | |
|---|-------------------------------------|
| Input Voltage | ±15 VDC (nominal), ±25 ma |
| Operating Temperature Range | 32°F to 160°F (0°C to 70°C) |
| Survival Temperature Range | -65°F to 200°F (-55°C to 95°C) |
| Null Voltage | 0 VDC |
| Ripple | Less than 25 mV rms |
| Linearity | 0.25% full range |
| Stability | 0.125% full scale |
| Temperature—Coefficient of Scale Factor | 0.04%/°F (0.08%/°C) |
| Shock Survival | 250 g for 11 milliseconds half sine |
| Vibration Tolerance | 10 g up to 2 kHz |
| Coil Form Material | High density, glass-filled polymer |
| Housing Material | AISI 400 series stainless steel |
| Electrical Termination | 6-pin connector |
| Output Impedance | Less than 1 ohm |

Performance and Electrical Specifications¹

| HCD Series Model Number | Nominal Linear Range | | Scale Factor | | Response -3 dB Hz |
|-------------------------|----------------------|-------|--------------|------|-------------------|
| | inches | mm | V/inch | V/mm | |
| 050 HCD | ±0.050 | ±1.25 | 200.0 | 8.00 | 500 |
| 125 HCD | ±0.125 | ±3.0 | 80.0 | 3.00 | 500 |
| 250 HCD | ±0.250 | ±6.0 | 40.0 | 1.60 | 500 |
| 500 HCD | ±0.500 | ±12.5 | 20.0 | 0.80 | 200 |
| 1000 HCD | ±1.000 | ±25 | 10.0 | 0.40 | 200 |
| 2000 HCD | ±2.000 | ±50 | 5.0 | 0.20 | 200 |
| 3000 HCD | ±3.000 | ±75 | 3.3 | 0.13 | 200 |
| 5000 HCD | ±5.000 | ±125 | 2.0 | 0.08 | 200 |
| 10000 HCD | ±10.000 | ±250 | 1.0 | 0.04 | 200 |

¹All calibration is performed at room ambient temperature.



HCD models, when correctly installed, are CE certified to comply with the EMC Directive 89/336/EEC.



HCD Series LVDT

Hermetically-Sealed
MS-Type Connector
DC-Operated

How to Order

Specify the HCD Model followed by the desired option number(s) added together.

Ordering Example:

Model Number 050 HCD-026 is an HCD Series LVDT with a ± 0.050 " range (050 HCD), with a Metric thread core (006) and a small diameter core (020).

HCD Model

Options

050 HCD
125 HCD
250 HCD
500 HCD
1000 HCD
2000 HCD
3000 HCD
5000 HCD
10000 HCD

Number Description

006 Metric Thread Core
010 Guided Core
020 Small Diameter, Low Mass Core¹
200 Captive Core²

¹ Consult factory for mass, dimensions and thread size.

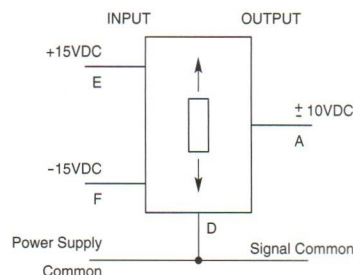
² Available on 050 HCD through 3000 HCD models only.

New Captive Core Option!

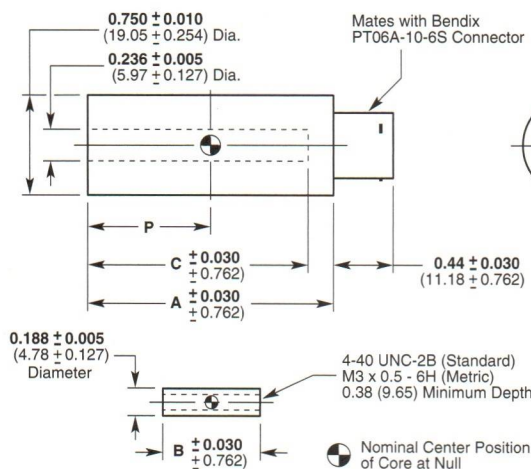
The HCD features a captive core design that greatly simplifies installation. The design utilizes a core rod and bearing assembly that is captured and guided within the LVDT providing low friction travel throughout the stroke length. The assembly incorporates two Delrin bearings on the core rod traveling through the stainless steel boreliner. A bronze bearing on the front end utilizes a self-aligning feature to accommodate lateral LVDT movement during operation. The core rod and bearing assembly are field replaceable. **See page 70 for specifications.**



Wiring



Dimensions in (mm)



Mechanical Specifications

| HCD Series Model Number | Weight | | | | Dimensions | | | | | | | |
|-------------------------------|--------|-----|------|----|------------|-------|----------|-------|-------|-------|-------|-------|
| | Body | | Core | | A (Body) | | B (Core) | | C | | P | |
| | oz | gm | oz | gm | in | mm | in | mm | in | mm | in | mm |
| 050 HCD | 1.41 | 40 | 0.07 | 2 | 2.40 | 61.0 | 0.75 | 19.1 | 1.90 | 48.3 | 0.55 | 14.0 |
| 125 HCD | 1.77 | 50 | 0.11 | 3 | 3.23 | 82.0 | 1.25 | 31.8 | 2.73 | 69.3 | 0.96 | 24.5 |
| 250 HCD | 2.19 | 62 | 0.18 | 5 | 4.10 | 104.1 | 2.00 | 50.8 | 3.60 | 91.4 | 1.39 | 35.3 |
| 500 HCD | 2.93 | 82 | 0.28 | 9 | 5.79 | 147.1 | 3.00 | 76.2 | 5.29 | 134.4 | 2.23 | 56.5 |
| 1000 HCD | 4.24 | 120 | 0.35 | 10 | 8.05 | 204.5 | 3.80 | 96.5 | 7.55 | 191.8 | 3.32 | 84.3 |
| 2000 HCD | 6.09 | 174 | 0.46 | 13 | 11.42 | 290.1 | 5.30 | 127.0 | 10.92 | 277.4 | 5.05 | 128.3 |
| 3000 HCD | 8.33 | 236 | 0.49 | 14 | 16.62 | 422.1 | 6.20 | 157.5 | 16.10 | 408.9 | 7.59 | 192.8 |
| 5000 HCD | 10.38 | 294 | 0.60 | 17 | 20.45 | 519.5 | 6.20 | 157.5 | 19.95 | 506.7 | 9.56 | 242.8 |
| 10000 HCD | 18.57 | 526 | 0.85 | 24 | 34.57 | 878.1 | 12.00 | 304.8 | 34.03 | 864.4 | 16.61 | 421.9 |

SCHAEVITZ
SENSORS

HCT 420 Series

Position Transmitter

The new HCT 420 linear position transmitter is a totally new concept in remote position sensing. All necessary LVDT conditioning is contained within the 0.75" (19.1 mm) diameter LVDT housing. The HCT is a two-wire loop powered linear position transmitter that operates with loop resistances of up to 700 Ω at 28 VDC. The transmitter is designed to minimize the effects of changes in loop resistance and electromagnetic interference on position indication.

The HCT is packaged in a hermetically-sealed, stainless steel housing, designed for the most adverse conditions. Units can withstand external pressure up to 1,000 psi (70 bars). The design is particularly suitable for use in remote valve position feedback, where AC power is not available to operate external signal conditioning. Standard ranges include 0.25" to 10.0", however, custom scaling is available for special OEM requirements.



Features

- ❑ **4–20 mA, two-wire operation**
- ❑ **Measurement ranges from 0.25" to 10.0"**
- ❑ **Self-contained electronics**
- ❑ **Hermetically-sealed housing**
- ❑ **Nonlinearity: $\leq 0.5\%$ full range**
- ❑ **Low cost**
- ❑ **Calibration certificate supplied with all models**

Applications

- ❑ **Valve position indication**
- ❑ **Outdoor use with long cable**
- ❑ **Control roller gap in rolling mills**
- ❑ **Process industries**
- ❑ **Ideal for noisy environments**

Options

- ❑ **Metric thread core**
- ❑ **Captive core option for convenient installation**
- ❑ **See accessories section for connector and cable options, page 72**

Specifications

| | |
|--------------------------------|--|
| Linear Range | 0.25", 0.50", 1.0", 2.0", 5.0" and 10" |
| Nonlinearity | |
| 0.25"–5.0" (6.36–127 mm) .. | $\leq 0.5\%$ |
| 10.0" (254 mm) | $\leq 1.0\%$ |
| Output | 4–20 mA, two-wire loop |
| Loop Supply | 12.75 to 28 VDC |
| Max Loop Resistance | 600 Ω @ 28 VDC |
| Output Noise & Ripple ... | 25 μ A rms (max) |
| Operating | |
| Temperature Range | -13°F to 185°F (-25°C to 85°C) |
| Coefficient of Sensitivity ... | 0.04%/°C (max) |
| Stability | 0.10% after 30 minute warm up |
| Frequency Response | 50 Hz (nominal at -3dB) |
| Controls | None required |
| Termination | 6-pin hermetically-sealed MS connector |

HCT 420 Series

2-wire 4-20 mA

Position Transmitter

How to Order

Specify the HCT model with the appropriate range followed by the desired option number(s) added together.

Ordering Example:

Model Number HCT 420-250-206 is an HCT Series LVDT transmitter with a 0 to 0.250" range (HCT 420-250), with a Metric thread core (006) and the captive core option (200).

| HCT 420 Model | Linear Range | |
|---------------|--------------|------------|
| | inches | mm |
| HCT 420-250 | 0 to 0.250 | 0 to 6.35 |
| HCT 420-500 | 0 to 0.500 | 0 to 12.7 |
| HCT 420-1000 | 0 to 1.0 | 0 to 25.4 |
| HCT 420-2000 | 0 to 2.0 | 0 to 50.8 |
| HCT 420-5000 | 0 to 5.0 | 0 to 127.0 |
| HCT 420-10000 | 0 to 10.0 | 0 to 254.0 |

Options

| Number | Description |
|--------|---------------------------|
| 006 | Metric Thread Core |
| 200 | Captive Core ¹ |

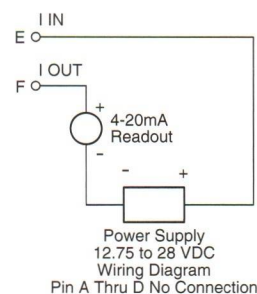
¹ Available on HCT 420-250 through HCT 420-5000 models only.

New Captive Core Option!

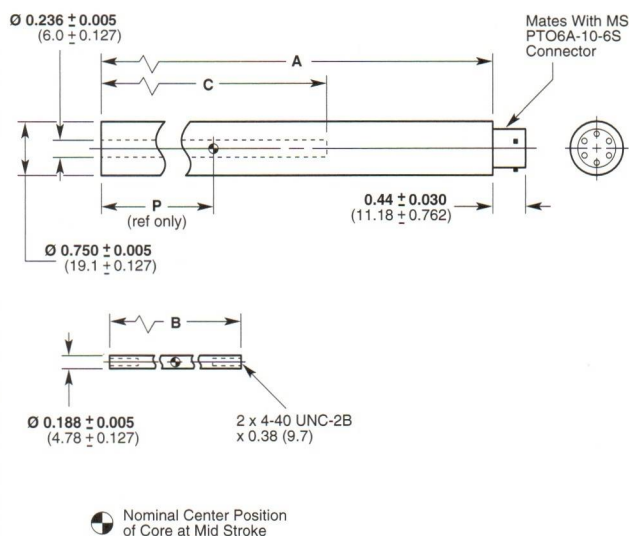
The HCT features a captive core design that greatly simplifies installation. The design utilizes a core rod and bearing assembly that is captured and guided within the LVDT providing low friction travel throughout the stroke length. The assembly incorporates two Delrin bearings on the core rod traveling through the stainless steel boreliner. A bronze bearing on the front end utilizes a self-aligning feature to accommodate lateral LVDT movement during operation. The core rod and bearing assembly are field replaceable. **See page 71 for specifications.**



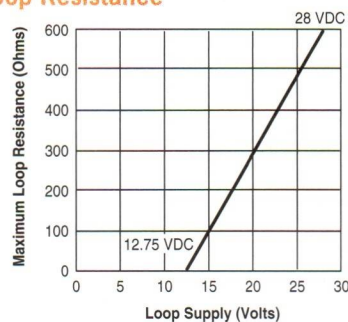
Wiring



Dimensions in (mm)



Maximum Loop Resistance



Mechanical Specifications

| HCT Series Model Number | Weight | | Dimensions | | | | | | | | | |
|-------------------------------|--------|-----|------------|-------|-------|-------|------|-------|-------|-------|------|-------|
| | Body | | Core | | A | | B | | C | | P | |
| | oz | gm | oz | gm | in | mm | in | mm | in | mm | in | mm |
| HCT 420-250 | 2.86 | 81 | 0.11 | 3.18 | 4.29 | 108.8 | 1.25 | 31.75 | 1.91 | 48.5 | 0.96 | 24.3 |
| HCT 420-500 | 3.70 | 105 | 0.18 | 4.99 | 5.41 | 137.4 | 1.80 | 45.7 | 3.11 | 79.0 | 1.52 | 38.7 |
| HCT 420-1000 | 4.34 | 123 | 0.29 | 8.16 | 6.82 | 173.2 | 3.00 | 76.2 | 4.46 | 113.3 | 2.23 | 56.6 |
| HCT 420-2000 | 5.46 | 155 | 0.39 | 10.43 | 9.08 | 230.5 | 3.80 | 96.5 | 6.72 | 170.7 | 3.36 | 85.2 |
| HCT 420-5000 | 6.73 | 191 | 0.39 | 10.43 | 12.18 | 309.4 | 3.80 | 96.5 | 9.90 | 251.5 | 4.91 | 124.6 |
| HCT 420-10000 | 12.73 | 361 | 0.62 | 17.69 | 21.49 | 545.7 | 6.20 | 157.5 | 19.22 | 488.2 | 9.56 | 242.8 |

SCHAEVITZ
SENSORS

HCT IS Series

Intrinsically Safe 2-wire 4-20 mA Position Transmitter

The HCT IS is a breakthrough position transmitter for use in hazardous locations. The two-wire loop configuration allows use with a single barrier and a minimum of wire or cable. True hermetic packaging of the coil assembly and electronics provides the maximum protection against adverse environments. 4-20 mA transmitter output is the favored configuration for process industries and power plants. Six standard ranges are available from 0 to 0.25 inches (6.35 mm), to 0 to 10 inches (250 mm). Custom scaling is available for OEM requirements. Small quantities are generally available for same day/next day delivery.



Features

- ☐ *FM, CSA and LCIE approved*
- ☐ *Entity approved – with appropriate barriers*
- ☐ *4–20 mA, two-wire operation*
- ☐ *Measurement ranges from 0.25" (6.35 mm) to 10.0" (250 mm)*
- ☐ *Self-contained electronics*
- ☐ *Hermetically-sealed housing*
- ☐ *Nonlinearity: $\leq 0.5\%$ full range*
- ☐ *Calibration certificate supplied with all models*

Applications

- ☐ *Valve position indication*
- ☐ *Outdoor use with long cable*
- ☐ *Control roller gap in rolling mills*
- ☐ *Process industries*
- ☐ *Ideal for noisy environments*

Options

- ☐ *Metric thread core*
- ☐ *Captive core option for convenient installation*

Specifications

| | |
|-----------------------------|--|
| Linear Range | 0.25", 0.50", 1.0", 2.0", 5.0", 10" |
| Nonlinearity | |
| 0.25"–5.0" (6.36–127 mm) .. | $\leq 0.5\%$ |
| 10.0" (254 mm) | $\leq 1.0\%$ |
| Output | 4–20 mA, two-wire loop |
| Loop Supply | 12.75 to 28.0 VDC |
| Max Loop Resistance | 600 Ω @ 28 VDC |
| Output Noise & Ripple ... | 25 μ A Pk-Pk (max) |
| Operating | |
| Temperature Range | -13°F to 185°F (-25°C to 85°C) |
| Temperature Coefficient | |
| of Sensitivity | 0.04%/°C (max) |
| Stability | 0.10% after 30 minute warm up |
| Frequency Response | 50 Hz min (-3dB) |
| Controls | None required |
| Termination | 6-pin hermetically-sealed MS connector |

Intrinsically Safe Approval Classification

- ☐ *Class I, Div. 1, Group A, B, C, D*
- ☐ *Class II, Div. 1, Group G*
- ☐ *Class III*

Intrinsically Safe Maximum Entity Parameters

- ☐ *$V_{max} = 32$ VDC $C_i = 12$ nF*
- ☐ *$I_{max} = 110$ mA $L_i = 0$*

* *Suggested barrier supplier: R Stahl,
Phone: 800/782-4357 or 9002/13-280-110-00*

HCT IS Series

Intrinsically Safe 2-wire 4-20 mA
Position Transmitter

How to Order

Specify the HCT IS model with the appropriate range followed by the desired option number(s) added together.

Ordering Example:

Model Number HCT 250 IS-206 is an HCT IS Series LVDT transmitter with a 0 to 0.250" range (HCT 250 IS), with a Metric thread core (006) and the captive core option (200).

| HCT IS Model | Linear Range | |
|--------------|--------------|------------|
| | inches | mm |
| HCT 250 IS | 0 to 0.250 | 0 to 6.35 |
| HCT 500 IS | 0 to 0.500 | 0 to 12.7 |
| HCT 1000 IS | 0 to 1.0 | 0 to 25.4 |
| HCT 2000 IS | 0 to 2.0 | 0 to 50.8 |
| HCT 5000 IS | 0 to 5.0 | 0 to 127.0 |
| HCT 10000 IS | 0 to 10.0 | 0 to 254.0 |

Options

Number Description

| | |
|-----|---------------------------|
| 006 | Metric Thread Core |
| 200 | Captive Core ¹ |

¹ Available on HCT 250 IS through HCT 5000 IS models only.

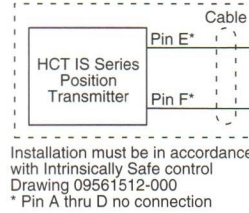
Captive Core Option

The HCT IS features a captive core design that greatly simplifies installation. The design utilizes a core rod and bearing assembly that is captured and guided within the LVDT providing low friction travel throughout the stroke length. The assembly incorporates two Delrin bearings on the core rod traveling through the stainless steel boreliner. A bronze bearing on the front end utilizes a self-aligning feature to accommodate lateral LVDT movement during operation. The core rod and bearing assembly are field replaceable. **See page 71 for specifications.**

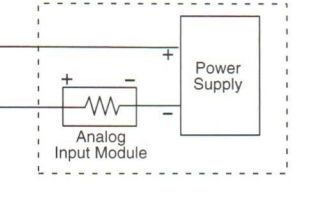


Wiring

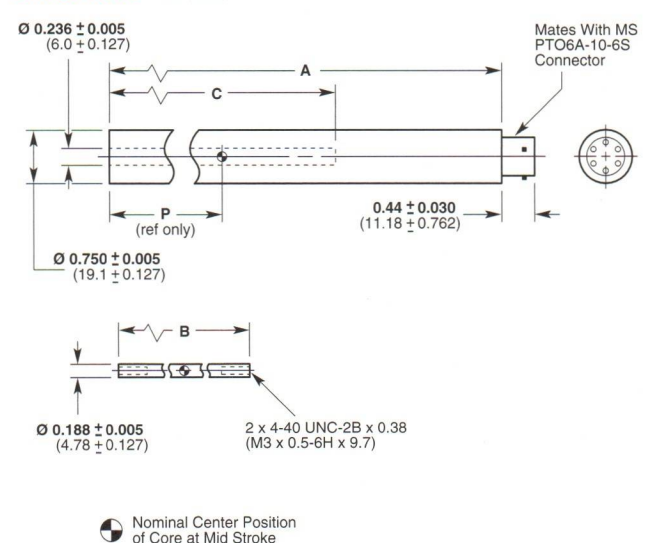
Hazardous Location



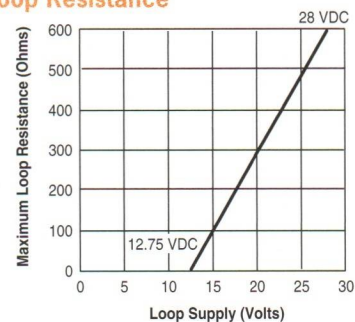
Non-Hazardous Location



Dimensions in (mm)



Maximum Loop Resistance



Mechanical Specifications

| HCT Series Model Number | Weight | | | | Dimensions | | | | | | | |
|-------------------------------|--------|-----|------|----|------------|-------|------|-------|-------|-------|------|-------|
| | Body | | Core | | A | | B | | C | | P | |
| | oz | gm | oz | gm | in | mm | in | mm | in | mm | in | mm |
| HCT 250 IS | 3.04 | 86 | 0.11 | 3 | 4.39 | 111.5 | 1.25 | 31.75 | 1.91 | 48.5 | 0.96 | 24.3 |
| HCT 500 IS | 3.63 | 103 | 0.18 | 5 | 5.51 | 140.0 | 1.80 | 45.7 | 3.11 | 79.0 | 1.52 | 38.7 |
| HCT 1000 IS | 4.38 | 124 | 0.29 | 8 | 6.92 | 175.8 | 3.00 | 76.2 | 4.46 | 113.3 | 2.23 | 56.6 |
| HCT 2000 IS | 5.38 | 153 | 0.38 | 11 | 9.18 | 233.2 | 3.80 | 96.5 | 6.72 | 170.7 | 3.36 | 85.2 |
| HCT 5000 IS | 6.51 | 185 | 0.38 | 11 | 12.28 | 311.9 | 3.80 | 96.5 | 9.90 | 251.5 | 4.91 | 124.6 |
| HCT 10000 IS | 12.93 | 367 | 0.62 | 18 | 21.59 | 548.4 | 6.20 | 157.5 | 19.22 | 488.2 | 9.56 | 242.8 |

CHAEVITZ
SENSORS

PTS 420 Series

Position Transmitter

The PTS 420 linear position transmitter consists of a one-piece linear position sensor and transmitter electronics. Configured for use in two-wire, current loops, the PTS 420 is compatible with most process controllers. Units are available in measurement ranges from 0.25" to 10". Rugged packaging and a large barrier type terminal strip facilitates installation and screwdriver adjustments provide for ease of calibration.

Designed with a rain-tight, splashproof housing, the PTS 420 is suitable for position measurements requiring stem-type valves such as the ones frequently used in process control, power generation, and other related applications. The PTS 420 can also be used for valve position indication, roll gap control in rolling mills, and where outdoor use with long cables is required.

Features

- ☐ 4–20 mA, two-wire operation
- ☐ Measurement ranges from 0.25" to 10.0"
- ☐ Low cost
- ☐ Zero and span adjustments
- ☐ Self-contained electronics
- ☐ Rugged splashproof housing
- ☐ Compatible with process controllers
- ☐ Ideal for noisy environments
- ☐ Calibration certificate supplied with all models

Specifications

| | |
|----------------------------|--|
| Linear Range | 0.25", 0.50", 1.0", 2.0", 5.0" and 10.0" |
| Linearity | <1.25% for 10" and 0.75% for others |
| Output | 4–20 mA, two-wire loop |
| Loop Supply | 10.5 to 28 VDC |
| Max Loop Resistance | 600 Ω @ 28 VDC |
| Output Noise & Ripple | 25 μ A rms (max) |
| Operating | |
| Temperature Range | -13°F to 185°F (-25°C to +85°C) |
| Coefficient of Sensitivity | 0.08%/°C (max) |
| Stability | 0.10% after 30 minute warm up |
| Frequency Response | 50 Hz (nominal at -3dB) |
| Controls | 10-turn potentiometers for zero and span |
| Termination | Terminal strip with two 8–32 screws |



Applications

- ☐ Process control
- ☐ Air-handling systems
- ☐ Power generation
- ☐ Filtration/water treatment
- ☐ Steel, aluminum, paper, rubber and plastic rolling mills

Valve Position Sensing

A PTS 420 is a two-wire current-loop position transmitter especially suited to valve position indication and other position indication in process industries.

Roll Gap Measurement

A typical application of the PTS 420 position transmitter is the measurement of the roll gap in rolling mills for steel, aluminum, and other primary metals. The same transmitter is adaptable to measuring the position of calendering rolls in paper mills, rubber plants, and plastic sheet and film manufacturing facilities.

Sluice Gate Control

The PTS 420 position transmitter can be used to measure the open height of sluice gates in sewage and waste water treatment plants. Other applications include power plant water supplies, potable water filtration plants, flood control dams, and industrial processes.

PTS 420 Series 2-wire 4-20 mA Position Transmitter

How to Order

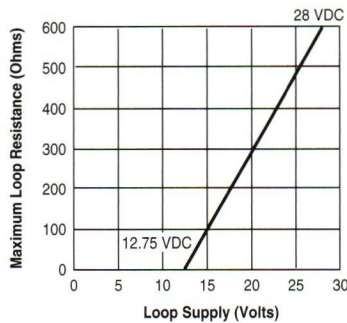
Specify the PTS model with the appropriate range.

Ordering Example:

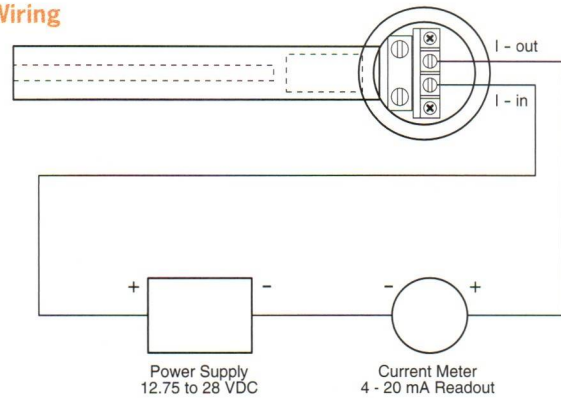
Model Number PTS 420-250 is an PTS 420 Series LVDT transmitter with a 0 to 0.250" range.

| PTS 420 Model | Linear Range | |
|---------------|--------------|------------|
| | inches | mm |
| PTS 420-250 | 0 to 0.250 | 0 to 6.35 |
| PTS 420-500 | 0 to 0.500 | 0 to 12.7 |
| PTS 420-1000 | 0 to 1.0 | 0 to 25.4 |
| PTS 420-2000 | 0 to 2.0 | 0 to 50.8 |
| PTS 420-5000 | 0 to 5.0 | 0 to 127.0 |
| PTS 420-10000 | 0 to 10.0 | 0 to 254.0 |

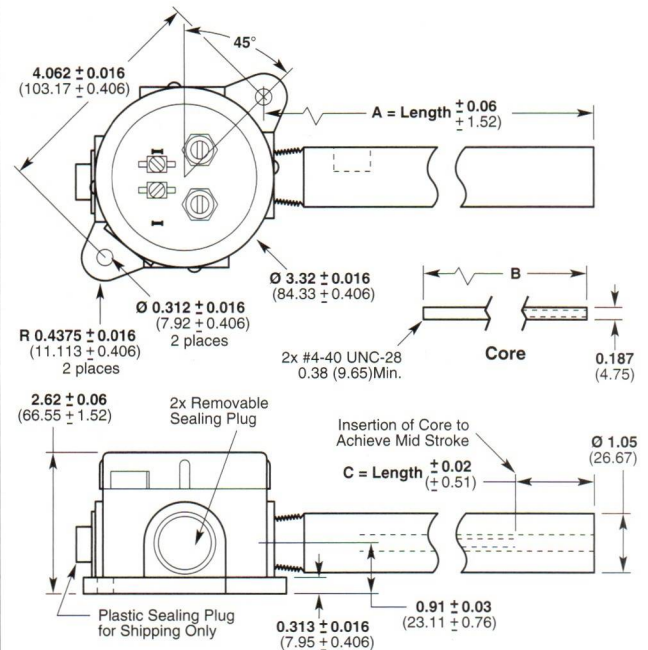
Maximum Loop Resistance



Wiring



Dimensions in (mm)



Mechanical Specifications

| PTS Series Model Number | Weight | | | | Dimensions | | | | | |
|-------------------------------|--------|------|------|----|------------|-------|------|-------|------|-------|
| | Body | | Core | | A | | B | | C | |
| | lb | gm | oz | gm | in | mm | in | mm | in | mm |
| PTS 420-250 | 1.62 | 735 | 0.11 | 3 | 3.53 | 89.7 | 1.10 | 27.9 | 0.44 | 11.2 |
| PTS 420-500 | 1.78 | 808 | 0.14 | 4 | 4.66 | 118.4 | 1.80 | 45.7 | 0.65 | 16.5 |
| PTS 420-1000 | 2.00 | 908 | 0.25 | 7 | 6.07 | 154.2 | 3.00 | 76.2 | 0.75 | 19.1 |
| PTS 420-2000 | 2.32 | 1053 | 0.35 | 10 | 8.34 | 211.8 | 3.80 | 96.5 | 1.48 | 37.6 |
| PTS 420-5000 | 2.50 | 1135 | 0.46 | 13 | 11.46 | 291.1 | 3.80 | 96.5 | 3.05 | 77.5 |
| PTS 420-10000 | 2.84 | 1290 | 0.49 | 14 | 20.77 | 527.6 | 6.20 | 157.5 | 6.48 | 164.6 |

CTS 420 Series

Position Transmitter System

The CTS 420 is a 2-wire current loop position transmitter system especially suited to valve position indication and other position indication in process industries. The system consists of an LVDT position sensor with matching electronics to provide 4-20 mA output into 2-wire current loops. The linear position sensors are available in six ranges covering 0-0.25" to 0-10.0". The CTS 420 System is particularly well suited for sensing valve position of stem-type valves because the sensor can be coupled directly to the valve's operating shaft for exceptional reliability and accuracy. Of special interest to the process industries is that the system's inductance and capacitance are well below the levels set for intrinsic safety requirements.

The LVDT sensor is constructed of stainless steel and is hermetically sealed and uses a non-contacting movable core, so there is nothing to wear out.

The electronics portion of the CTS 420 system is contained on a 3 x 5 inch circuit board which can be installed up to 25 feet from the sensor. All external connections and adjustment controls are mounted directly on the board. The electronics board is also available with an optional splashproof enclosure.

How to Order

Specify the CTS model with the appropriate range. Add MC to model number for optional metric core. Optional splashproof electronics enclosure is ordered separately.

Ordering Example:

Model Number CTS 420-250-MC is a CTS 420 Series LVDT transmitter with a 0 to 0.250" range and a metric core.

| CTS 420 Model | Linear Range | |
|---------------|--------------|------------|
| | inches | mm |
| CTS 420-250 | 0 to 0.250 | 0 to 6.35 |
| CTS 420-500 | 0 to 0.500 | 0 to 12.7 |
| CTS 420-1000 | 0 to 1.0 | 0 to 25.4 |
| CTS 420-2000 | 0 to 2.0 | 0 to 50.8 |
| CTS 420-4000 | 0 to 4.0 | 0 to 101.6 |
| CTS 420-10000 | 0 to 10.0 | 0 to 254.0 |
| CTS 420 90 | 0 to 90° | |

Options

| | |
|------------------------------|--|
| Metric Core | Add "MC" to model number. |
| Interconnecting Cable | Consult factory for ordering information and pricing. |
| Electronics Enclosure | To order optional JIC enclosure, specify part # 61403006-000 as a separate item. |



The CTS 420 Transmitter is compatible with the R36AS Rotary Positioner (see page 132 for specifications)

Features

- ☐ 4-20 mA, two-wire operation
- ☐ Measurement ranges from 0.25" to 10.0"
- ☐ Operates in a wide temperature range
- ☐ Compact size

Options

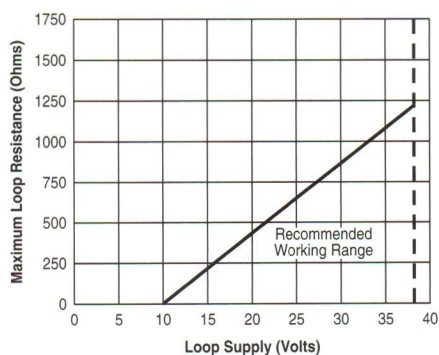
- ☐ Rugged splashproof housing for control electronics
- ☐ Metric core
- ☐ Interconnecting cable

General Specifications

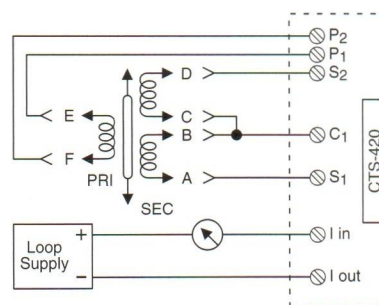
| | |
|-------------------------------------|---------------------------------|
| Loop Supply Voltage | 10-36 VDC |
| Max Loop Resistance | 1100Ω @ 36 V |
| Output | 4-20 mA |
| Frequency Response | 100 Hz |
| Linearity | 1.5% of full span output |
| Stability | 0.05% of full span output |
| Operating Temperature Range: | |
| (electronics only) | |
| -40°F to 200°F (-40°C to 95°C) | |
| Thermal Coefficient of | |
| Sensitivity | |
| ±0.02%/°F (±0.04%/°C) (max) | |
| Controls | Zero and span |

LVDT Specifications

| | |
|--------------------------------|--|
| Temperature Range | -65°F to 300°F (-55°C to 150°C) |
| Housing Material | AISI 400 Series stainless steel |
| Termination | 6-pin hermetically-sealed MS connector |

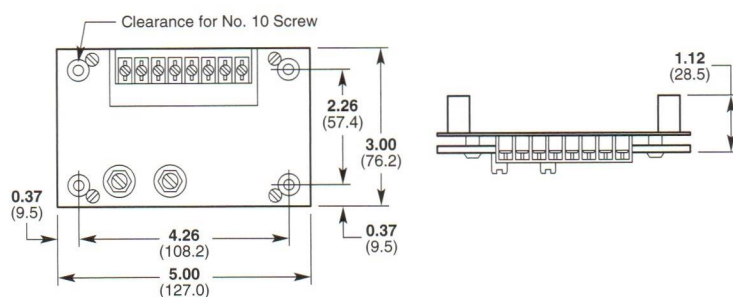


Wiring



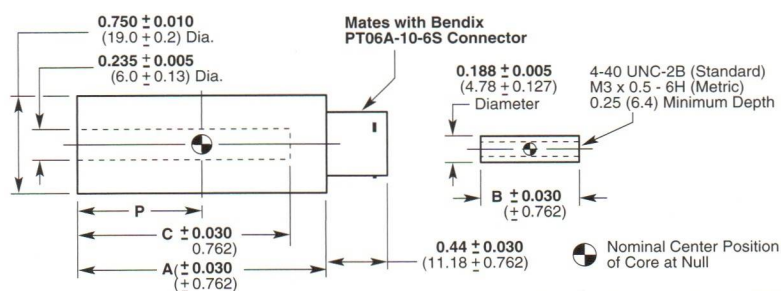
Dimensions in (mm)

Module



With optional JIC enclosure dimensions are:
6" L x 4" W x 4" H (152 mm x 101.6 x 101.6 mm)

LVDT

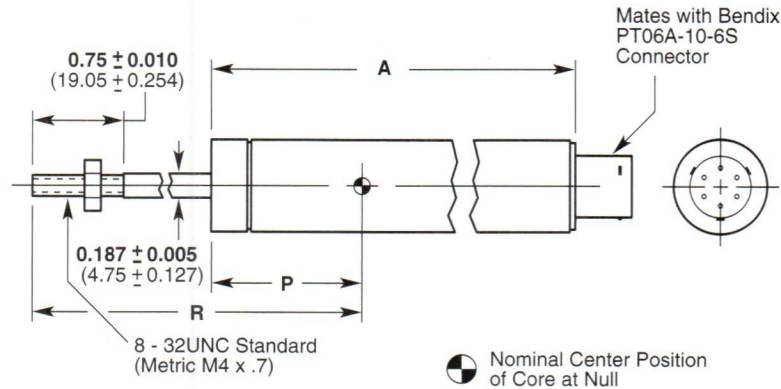


Mechanical Specifications

| CTS Sensor Model Number | Weight | | | | Dimensions | | | | | | | |
|-------------------------------|--------|-----|------|----|------------|-------|------|-------|------|-------|-------|-------|
| | Body | | Core | | A | | B | | P | | C | |
| | oz | gm | oz | gm | in | mm | in | mm | in | mm | in | mm |
| CTS 420-250 | 1.73 | 49 | 0.11 | 3 | 2.48 | 63.0 | 1.10 | 27.9 | 0.96 | 24.3 | 1.91 | 48.5 |
| CTS 420-500 | 2.58 | 73 | 0.14 | 4 | 3.84 | 97.5 | 1.80 | 45.7 | 1.52 | 38.7 | 3.25 | 82.5 |
| CTS 420-1000 | 2.93 | 83 | 0.28 | 8 | 5.03 | 127.8 | 3.00 | 76.2 | 2.23 | 56.6 | 4.46 | 113.2 |
| CTS 420-2000 | 5.22 | 148 | 0.39 | 11 | 7.29 | 185.2 | 3.80 | 96.5 | 3.32 | 84.3 | 6.72 | 171.0 |
| CTS 420-4000 | 5.65 | 160 | 0.46 | 13 | 10.68 | 271.3 | 5.00 | 127.0 | 5.05 | 128.3 | 10.20 | 259.1 |
| CTS 420-10000 | 10.31 | 292 | 0.49 | 14 | 19.70 | 500.1 | 6.20 | 157.5 | 9.56 | 242.8 | 19.12 | 485.6 |

Captive Core Option

Connector Configurations for HCA, HCD and HCT Series



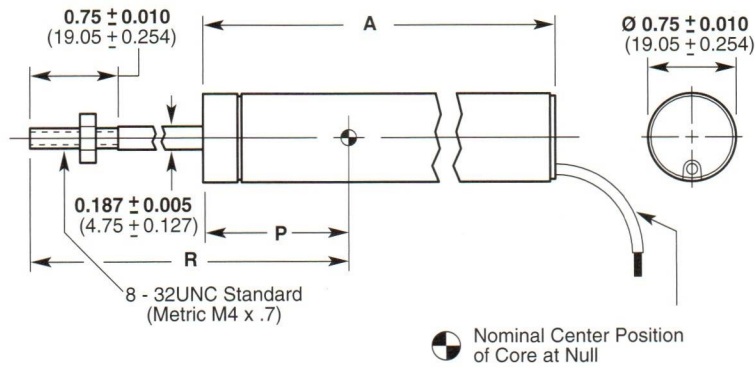
Mechanical Specifications

| | Model Number | Linear Range | | Weight Assembly | | A | | Dimensions P | | R | |
|-----------------------------|--------------|--------------|--------|-----------------|-----|-------|-------|--------------|-------|-------|-------|
| | | in | mm | oz | gm | in | mm | in | mm | in | mm |
| HCA Series (See Page 44) | 050 HCA | ±0.050 | ±1.25 | 1.98 | 56 | 2.00 | 50.8 | 0.89 | 22.8 | 3.70 | 94.0 |
| | 125 HCA | ±0.125 | ±3.0 | 2.61 | 74 | 2.84 | 72.1 | 1.30 | 33.0 | 4.28 | 108.7 |
| | 250 HCA | ±0.250 | ±6.0 | 3.14 | 89 | 3.70 | 94.0 | 1.73 | 43.9 | 4.75 | 120.7 |
| | 500 HCA | ±0.500 | ±12.5 | 4.06 | 115 | 5.39 | 136.9 | 2.57 | 65.3 | 6.04 | 153.4 |
| | 1000 HCA | ±1.000 | ±25 | 6.64 | 188 | 7.63 | 193.8 | 3.66 | 93.0 | 7.90 | 200.7 |
| | 2000 HCA | ±2.000 | ±50 | 7.38 | 209 | 11.02 | 279.9 | 5.39 | 138.9 | 10.52 | 267.2 |
| | 3000 HCA | ±3.000 | ±75 | 10.63 | 301 | 16.10 | 408.9 | 7.93 | 201.4 | 15.27 | 387.9 |
| HCD Series (See Page 60) | 050 HCD | ±0.050 | ±1.25 | 2.19 | 62 | 2.74 | 69.6 | 0.89 | 22.8 | 3.78 | 96.0 |
| | 125 HCD | ±0.125 | ±3.0 | 2.65 | 75 | 3.57 | 90.7 | 1.30 | 33.0 | 4.36 | 110.7 |
| | 250 HCD | ±0.250 | ±6.0 | 3.14 | 89 | 4.44 | 112.8 | 1.73 | 43.9 | 4.85 | 123.2 |
| | 500 HCD | ±0.500 | ±12.5 | 4.06 | 115 | 6.13 | 155.7 | 2.57 | 65.3 | 6.04 | 153.4 |
| | 1000 HCD | ±1.000 | ±25 | 5.61 | 159 | 8.39 | 213.1 | 3.66 | 89.4 | 7.90 | 200.7 |
| | 2000 HCD | ±2.000 | ±50 | 7.87 | 223 | 11.76 | 298.7 | 5.39 | 113.4 | 10.52 | 267.2 |
| | 3000 HCD | ±3.000 | ±75 | 10.63 | 301 | 16.96 | 430.8 | 7.93 | 201.4 | 15.27 | 387.9 |
| HCT Series (See Page 62) | HCT 420-250 | 0-0.250 | 0-6.25 | 3.74 | 106 | 4.63 | 117.6 | 1.30 | 33.0 | 4.36 | 110.7 |
| | HCT 420-500 | 0-0.500 | 0-12.5 | 4.66 | 132 | 5.75 | 146.1 | 1.86 | 47.2 | 4.75 | 120.7 |
| | HCT 420-1000 | 0-1.000 | 0-25 | 5.47 | 155 | 7.16 | 181.9 | 2.57 | 65.3 | 6.04 | 153.4 |
| | HCT 420-2000 | 0-2.000 | 0-50 | 6.85 | 194 | 9.42 | 239.3 | 3.88 | 93.5 | 7.87 | 199.9 |
| | HCT 420-5000 | 0-5.000 | 0-125 | 9.60 | 272 | 12.52 | 318.0 | 5.25 | 133.4 | 12.36 | 313.9 |

Captive Core Option

Lead Wire Models for DC-EC and DC-SE Series

Available for most models
within the HCA, DC-EC,
DS-SE, HCD and HCT Series



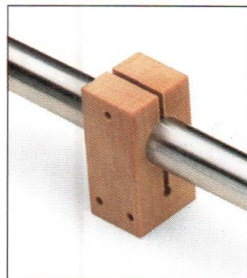
Mechanical Specifications

| | Model Number | Linear Range | | Weight Assembly | | A | | P | | R | |
|-------------------------------|-----------------|--------------|--------|--------------------|-----|-------|-------|------|-------|-------|-------|
| | | in | mm | oz | gm | in | mm | in | mm | in | mm |
| DC-EC Series (See Page 56) | 050 DC-EC | ±0.050 | ±1.25 | 2.97 | 84 | 2.48 | 63.0 | 0.84 | 21.3 | 3.78 | 98.0 |
| | 125 DC-EC | ±0.125 | ±3.0 | 3.32 | 94 | 3.31 | 84.1 | 1.27 | 32.3 | 4.36 | 110.7 |
| | 250 DC-EC | ±0.250 | ±6.0 | 3.53 | 100 | 4.18 | 84.1 | 1.69 | 42.9 | 4.85 | 123.2 |
| | 500 DC-EC | ±0.500 | ±12.5 | 4.02 | 114 | 5.87 | 149.1 | 2.54 | 64.5 | 6.04 | 153.4 |
| | 1000 DC-EC | ±1.000 | ±25 | 5.61 | 159 | 8.13 | 206.5 | 3.52 | 89.4 | 7.90 | 200.7 |
| | 2000 DC-EC | ±2.000 | ±50 | 7.20 | 204 | 11.50 | 292.1 | 5.22 | 143.3 | 10.52 | 267.2 |
| DC-SE Series (See Page 58) | 3000 DC-EC | ±3.000 | ±75 | 11.68 | 331 | 16.70 | 424.2 | 7.89 | 200.4 | 15.27 | 387.9 |
| | 100 DC-SE | 0-0.100 | 0-2.5 | 1.52 | 43 | 3.85 | 97.8 | 0.85 | 21.6 | 3.69 | 93.7 |
| | 250 DC-SE | 0-0.250 | 0-6.0 | 4.09 | 116 | 4.70 | 119.4 | 1.27 | 32.3 | 4.28 | 108.7 |
| | 500 DC-SE | 0-0.500 | 0-12.5 | 4.34 | 123 | 5.54 | 140.7 | 1.69 | 42.9 | 4.75 | 120.7 |
| | 1000 DC-SE | 0-1.000 | 0-25 | 5.51 | 156 | 7.23 | 183.6 | 2.54 | 64.5 | 6.04 | 153.4 |
| | 2000 DC-SE | 0-2.000 | 0-50 | 7.62 | 216 | 9.21 | 233.9 | 3.53 | 89.7 | 7.90 | 200.7 |
| | 4000 DC-SE | 0-4.000 | 0-100 | 10.13 | 287 | 12.59 | 319.8 | 5.22 | 132.6 | 10.52 | 267.2 |
| | 6000 DC-SE | 0-6.000 | 0-150 | 12.92 | 366 | 17.64 | 448.1 | 7.90 | 200.7 | 15.27 | 387.9 |

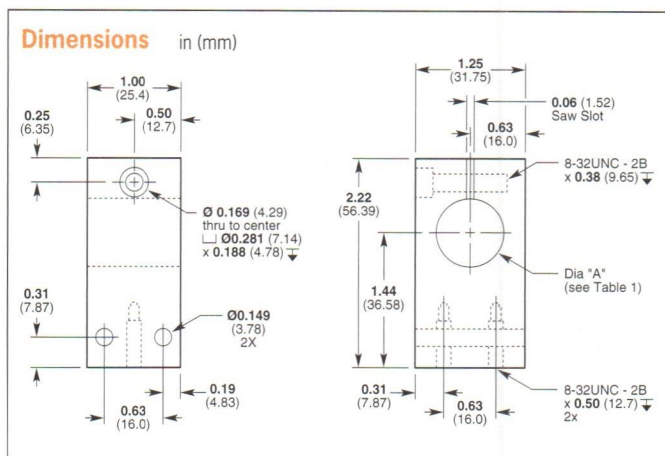
LVDT Accessories

LVDT Mounting Blocks

Frequently, LVDT installations require a convenient method to mount the units. Ready-made mounting blocks are available for all LVDT Series (except XS-B). Constructed of reinforced phenolic and other nonconductive materials with a low-temperature coefficient of expansion, mounting blocks are a convenient, inexpensive and fast solution for LVDT installation.



To Order: use the chart below to specify the part number for the appropriate LVDT Series.



LVDT Mounting Blocks

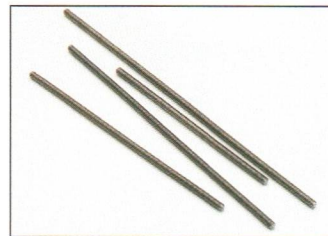
| Part Number | Use with LVDT Series | Dim. A Diameter | LVDT Diameter |
|--------------|----------------------|-----------------|---------------|
| 04560950-000 | E | 0.77 | 0.750 |
| 04560952-000 | HR | 0.83 | 0.812 |
| 04560953-000 | M | 0.33 | 8 mm |
| 04560954-000 | MHR | 0.39 | 0.375 |
| 04560956-000 | M-12 | 0.49 | 12 mm |

MS-Type Connector Cables

Consult factory for price and availability of adaptor cables for LVDTs and signal conditioners.

Core Connecting Rods

LVDT installations require a connecting rod between the LVDT core and the object whose motion is being measured. These connecting rods are fabricated from non-magnetic stainless steel to prevent distortion of the LVDT's magnetic field.



Manufactured from AISI 300 Series stainless steel, core connecting rods are threaded end to end. (Consult factory for available lengths and sizes.)

To Order: Specify CCR-(Length)-(LVDT Series)-(S for standard thread or M for metric thread). For example, to order a 4" rod to go with an MHR Series LVDT equipped with the optional metric thread core, specify: CCR-4-MHR-M

PSD 4-15 DC LVDT Power Supply

The PSD 4-15 DC LVDT power supply is designed to work with all of Schaevitz® DC powered LVDTs. The module will operate on either a 115 VAC or 230 VAC input at 47 to 63 Hz. The PSD 4-15 provides the necessary ± 15 VDC excitation to operate as many as four DC-EC or HCD Series LVDTs, as well as GCD Series gage heads or DC powered Schaevitz® RVDTs (see rotary section) or pressure transducers (see pressure section) that require a ± 15 VDC input. The rugged, compact design can be chassis mounted and features a DIN standard rail mount for secure installation in most industrial environments. In addition, the PSD 4-15 is UL, VDE and cUL approved and CE certified.



General Specifications

| | |
|-----------------------|--|
| Input Voltage | 115/230 VAC $\pm 10\%$ |
| Input Frequency | 47 to 63 Hz |
| Input Current | 0.1 A (max) |
| Output Voltage | ± 15 VDC $\pm 0.05\%$ |
| Output Current | 100 mA continuous |
| Ripple | < 5 mV. pp. |
| Noise | < 5 mV. pp. |
| Overload Protection | Continuous |
| Overall Dimensions | 2.00 x 4.31 x 0.90 inches; (51 x 110 x 23 mm) |
| Operating Temperature | -25°C to 70°C |

Linear Displacement Gage Heads



LVDT
Dimensional
Gage Heads

Schaevitz® LVDT Gage Head Technology

Selection Overview



The LVDT (Linear Variable Differential Transformer) gage head is the most widely used electronic measurement device for machine tool inspection equipment and quality control departments.

LVDT gage heads may be used as direct replacements for mechanical and digital dial gages providing superior resolution and repeatability.

Several variations of the LVDT gage head have been developed for specific applications. Choosing the right gage head for an application depends on a number of factors: materials to be gaged, required precision of data, as well as the installation configuration. The factors illustrated at right should be considered when choosing the correct electronic gaging device for your application.

Gaging Method
Contacting/Non-contacting

Accuracy
Ultra-precision
Precision
Economy

Special Operating Conditions
Hostile Environments
Heavy Side Loads
Hard-to-Reach Places
Space Restrictions

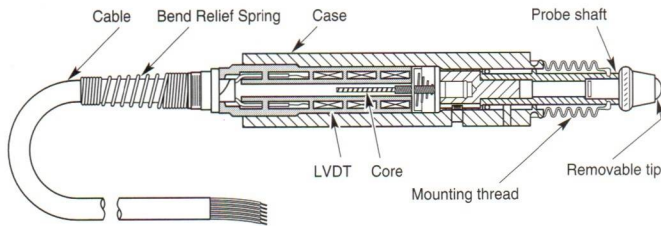
Input/Output
AC or DC Operated

Gaging Range

Gaging Methods

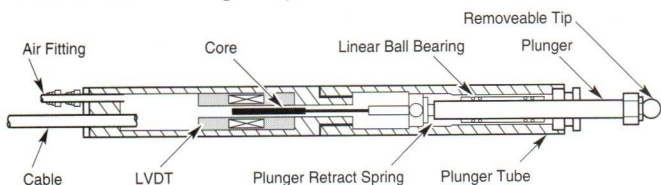
Contacting gage heads make physical contact with the object being measured. These gage heads are offered with spring-extend or air-extend, spring-retractable probes.

• **Spring-extend gaging probes**, the industry's standard design, consist of an LVDT assembly whose core is connected to a spring-loaded plunger having a removable tip. A conical compression spring provides a tip force of nominally 70 grams at null. Units offer a compact sizing to stroke ratio. The plunger is guided in a bearing or bushing, retained in a case that encloses the LVDT coil windings. The case may be threaded externally to simplify mounting. With no physical contact between its core and coils, the LVDT produces a highly repeatable, low noise output voltage linearly proportional to plunger displacement. Output may be sensed, amplified, and displayed with an LVDT compatible signal conditioner, digital readout or LVDT computer-based system.



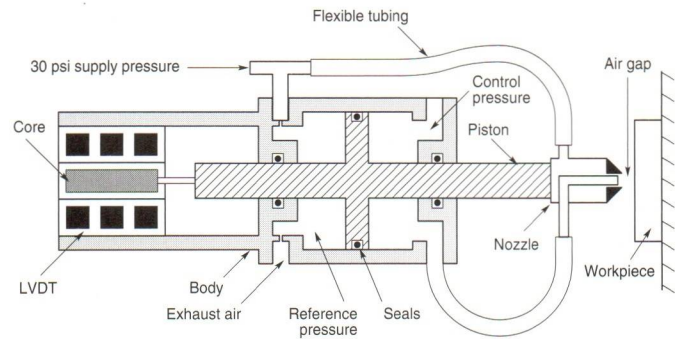
Spring-Loaded LVDT Gage Head

• **Air-extend, spring-retract gage heads** operate from dry, oil-free air. The probe spring is reversed to hold the plunger in the retracted position. Low pressure air is introduced to the end of the gage head opposite the plunger. Probe force is proportional to applied air pressure. By varying air pressure, users can limit gaging force to ensure the probe does not mar finely finished surfaces or distort delicate parts. Unit configuration reduces fixture complexity.



Typical Air-Extend LVDT Gage Head

Noncontacting Gage Heads maintain an air gap between the gaging probe and the object being measured. These gage heads are used for applications in which it is undesirable to make physical contact with the object being measured. An LVDT coupled to a pneumatic servo-follower creates an air gap between the nozzle follower and the workpiece. The LVDT measures nozzle displacement as it tracks the profile of a part and converts this movement to a change in electrical output. These noncontacting gaging probes are ideal for static and low speed dynamic measurement of fragile materials, delicate coatings and easily scratched components.



Simplified cross-section of pneumatic servo-follower coupled to LVDT.

Pneumatic servo-followers are available in strokes up to ± 1 inch. The standard nozzle produces about a 1/2 ounce (15 grams) air stream force on a minimum 1/16 inch (1.6 mm) circle at a typical 0.003 inch gap. A pneumatic booster-amplifier also is available which permits larger gaps to be maintained with the part under measurement.

Gage Accuracy

When considering performance, there are three general accuracy classes of LVDT gage heads.

Ultra-precision gaging probes are characterized by excellent linearity (0.2% F.R.O.), repeatability of ≤ 0.000002 ", and the lowest error from plunger radial movement. These gage heads provide repeatable measurement with accuracy impossible to achieve with mechanical dial indicators, satisfying precision requirements of today's manufacturing processes. Ultra-precision models are AC-operated and are available in ranges of ± 0.020 " to ± 0.200 ".

Precision gage heads are characterized by good linearity, typically better than 0.25% of full range. Excellent repeatability, typically 0.000025", is provided by a precision matched bushing or bearing and probe assembly. Most precision gage heads have an external mounting thread case, are available in AC and DC configurations with gaging ranges from ± 0.05 " to ± 2.0 ".

Economy gage heads are designed to give a good level of performance at moderate cost. Economy gage heads incorporate a lower cost LVDT having a linearity of better than 0.5% of full range. The shaft is loosely fitted in a nylon sleeve bearing and is free to rotate. Shaft loading is accomplished by an external helical compression spring. As the 3/4" diameter case of the economy gage head is not threaded, Schaevitz® mounting blocks or a similar clamping device is required. Economy models are AC operated and available in gaging ranges from ± 0.10 " to ± 0.30 ".

Schaevitz® LVDT Gage Head Technology

Selection Overview

Special Operating Conditions

Special configurations of Schaevitz® gaging probes address different physical and environmental factors of an application.

Hostile Environments

Hermetically sealed gage heads perform in environments containing moisture, dirt and other contaminants.

Heavy Side Loads

Ultra-tough gage heads operate efficiently against external pressures up to 1,000 psi (700 bars). Life of the probe is estimated at 8,000,000 cycles with side loads of 26 pounds.

Hard-to-Reach Places

Bi-directional lever probes measure in any plane, enabling gaging of parts in hard-to-reach places. Unit configuration eliminates the need for expensive, custom-designed fixtures usually required.

Miniature Fixtures

Measuring only 0.75" in length, Schaevitz® ultra-compact gage heads are one of the smallest sensors on the market today. Its size permits design of gaging fixtures without trade-offs between space and performance.

Input/Output

AC-operated gage heads typically require an excitation of 3.5 Vrms at 2.5 kHz. Most units however, work well with an excitation of 1 to 5 Vrms, at up to 10 kHz. The sensitivity of an AC-operated gage head is rated in mV, per volt of excitation, per 0.001" of plunger movement.

Advantages to using AC-operated gaging transducers:

- Compact size simplifies tooling design
- Less susceptibility to temperature changes in the manufacturing environment. (Better temperature coefficient and operating ranges.)
- Flexible scaling and zero offset.

DC-operated gage heads require a ± 15 VDC, bi-polar power supply, at 30 mA. The analog output scaling and zero position are preset at the factory. DC-operated gage heads are scaled for ± 10 VDC at \pm full scale displacement.

Advantages of using DC-operated transducers:

- Easy implementation. Units need no special external amplifiers or demodulators.
- A high level output may be sent over longer cable runs, with less susceptibility to electromagnetic influences.

Gaging Range

The maximum \pm linear travel of a gaging probe denotes its range. Users can specify range as the distance a gage head must travel \pm from its installation or zero position to measure the maximum \pm surface variation of an object. Gaging range is always measured from the zero position.

Ultra-Precision Gage Heads

LBB Series

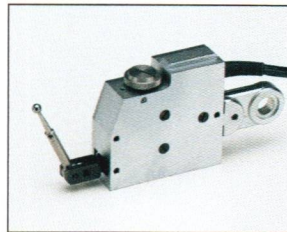


Pages 78-84

- Linear ball bearing design extends unit life
- Reduces friction and associated wear during operation
- Excellent linearity of $\pm 0.20\%$ FRO and repeatability of ± 0.000004 "
- Spring-extend versions with linear ranges of:
 - ± 0.020 " (page 80)
 - ± 0.040 " (page 81)
 - ± 0.100 " (page 82)
 - ± 0.200 " (page 84)
- Air-extend, spring retract versions with ± 0.100 " linear range (page 83) offers extra retract range for ease of fixturing
- Plain or threaded body styles
- 0.315" or 0.375" body diameter
- AC operated

Ultra-Precision Bi-directional Lever Probe

PCA-499 Series



Pages 85

- Bi-directional lever probe is positionable in any plane which makes this gage head ideal for hard to reach areas
- Adjustable probe force
- Linearity of $\pm 0.20\%$ FRO
- Linear range of ± 0.020 "
- Eliminates gage fixturing
- AC operated

Precision Gage Heads

GCA/GCD/GCD-SE Series

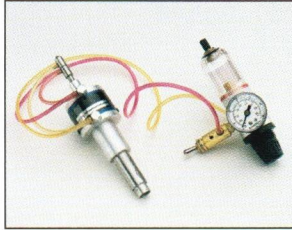


Page 86-89

- Spring-loaded, precision repeatability
- CE compliant (DC models)
- Twelve models available with linear ranges from ± 0.050 " to ± 2.00 "
- Hermetically sealed electronics and all-welded construction resistant to harsh environments
- Linearity of $\pm 0.25\%$ FRO
- AC or DC operated

Non-Contacting Precision Gage Heads

PPA/PPD Series

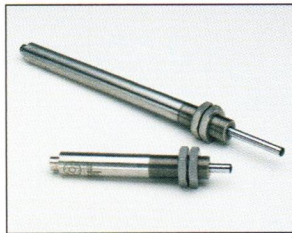


Page 90-93

- Non-contacting design provides high sensitivity over a wide linear measurement range of ± 0.050 to ± 1.00 "
- Utilizes 30 psi (nom) input air pressure
- Six AC or DC operated models

Ultra-Tough Precision Gage Heads

RBB Series



Page 94-95

- Ultra rugged design provides long service life and withstands heavy side loads
- Hermetically sealed to resist hostile environments
- Linear measurement range of ± 0.250 or ± 1.00 "
- Linearity of $\pm 0.25\%$ FRO
- AC or DC operated

Ultra-Compact Precision Gage Heads

PCA375 Series

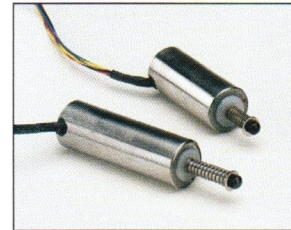


Page 96-97

- Ultra compact design fits into space restricted fixturing, small diameter openings and other limited space applications
- Linear measurement range of ± 0.020 "
- Linearity better than $\pm 0.25\%$ FRO
- AC operated

Economy Gage Heads

PCA-116 Series



Page 98-99

- Good reliability and performance for cost-sensitive applications
- Linear ranges from ± 0.10 " to ± 0.30 "
- Linearity of $\pm 0.5\%$ FRO
- AC operated

Options and Accessories

Connectors



Page 100

- Seven different connector options are available for all LBB Series PCA Series gage heads
- Connector options simplify installation
- Cable assemblies

Contact Tips

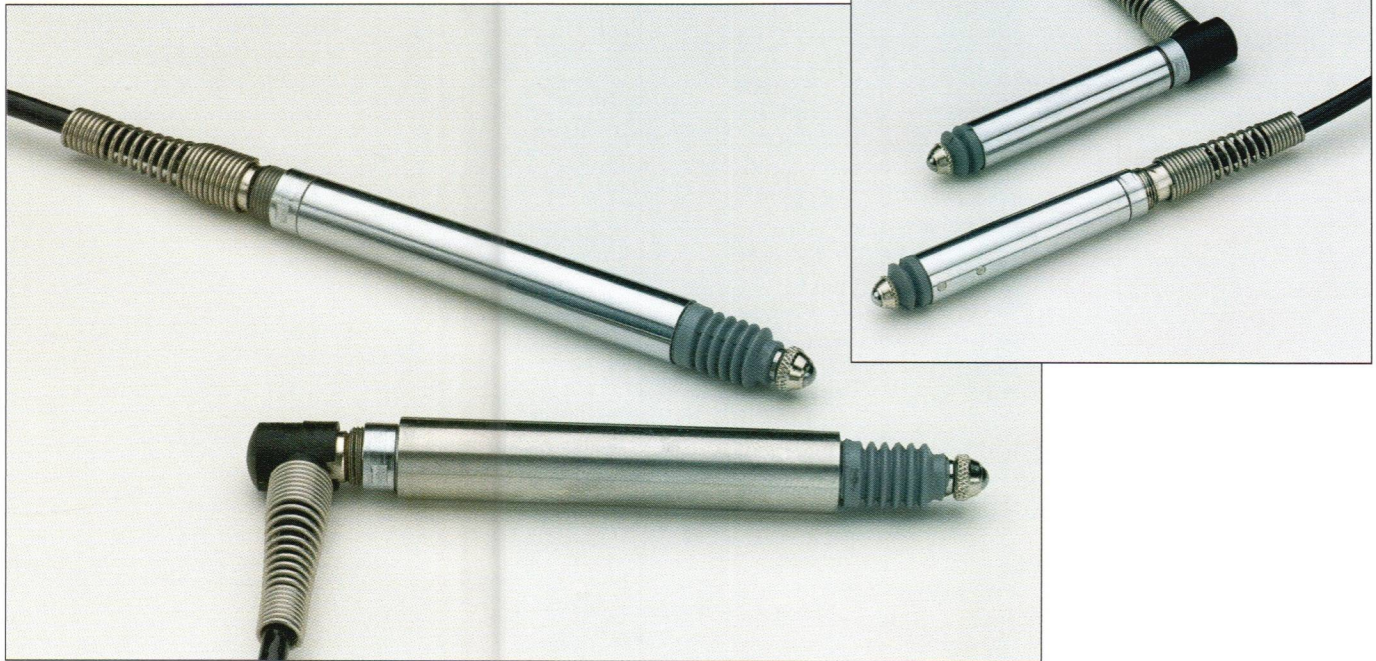


Page 100

- Nine different contact tips are available for special applications
- Can replace any gage head contact tip with a 4-48 thread

LBB Series Ultra-Precision Gage Heads

Linear Ball Bearing Design; Spring-Extend and Air-Extend



The Linear Ball Bearing (LBB) series of dimensional gaging probes is engineered for highly precise and repeatable measurements in quality control and metrology applications.

Linear ball bearings within the gaging probe minimize radial play and friction for ultra-precise measurement. Bearing assemblies utilize two circumferential rows of miniature balls held in position by a retainer. The balls ride on a non-rotating plunger hardened to Rockwell 65, hard-chrome plated and precision ground for optimal repeatability and resistance to brinelling. The contact end of the plunger has a removable tungsten carbide ball tip, with an AGD standard 4-48 UNF-2A threading. (See page 100 for replacement and alternate tips.)

Plunger and bearings are enclosed in a cylindrical housing, hand-honed and fit to the ball bearing assembly. Precision fitting provides for exceptional gage head repeatability. With the bearings and housing essentially matched in hardness, the plungers can better tolerate side loads for a longer unit life.

LVDT Configuration

A Linear Variable Differential Transformer (LVDT) is contained in the opposite end of the tubular housing. With no physical contact between its core and coils, the LVDT produces a highly repeatable, low noise output voltage linearly proportional to probe displacement. Output can be sensed, amplified and displayed with any Schaevitz® LVDT compatible signal conditioner, digital readout or LVDT computer based system (see the LVDT Instrumentation section of this catalog, page 111).

LBB gage heads feature a unique two-piece construction. Units, therefore, are repairable should either probe structure or cables become damaged. A bend relief spring prevents cable damage at lead exit.

Positive mechanical stops prevent damage to the LVDT from severe impacts to the end of the contact tip in cases of overstroke.

Features

- ❑ *AC-operated*
- ❑ *Linear ball bearing assemblies*
- ❑ *Removable tungsten carbide contact tip for long-term reliability and interchangeability*
- ❑ *Double-shielded LVDT for greater protection from effects of magnetic materials*
- ❑ *Polyurethane-jacketed cable enhances flexibility and improves chemical resistance*
- ❑ *Standard Viton boot for greater resistance to chemicals and high temperatures*
- ❑ *Radial cable exit adaptor supplied*

Gaging Methods

Spring-Extend Gage Heads

Standard spring-extend LBB gage heads possess user-adjustable pretravel/overtravel settings. Units are available in both 3.15" (8 mm) and 0.375" (9.5 mm) diameters, with the latter available in both threaded and non-threaded housings. A 0.375" (9.5 mm) diameter, plain or threaded sleeve, can be provided for OEMs who want to stock one model with two diameters.

Air-Extend, Spring-Retract Gage Heads

Air-extend, spring-retract units are manufactured in a $\pm 0.100"$ (± 2.5 mm) gaging range. These units require dry, oil-free air at 5 to 15 psi (0.34 to 1 bar). By varying air pressure, users can control gaging force to ensure the probe does not damage finely finished surfaces or distort delicate parts. Air extend models are available in 0.375" diameters with either threaded or non-threaded housings.

Gaging Ranges

| | |
|--------------|-----------------------------|
| $\pm 0.020"$ | Spring-extend |
| $\pm 0.040"$ | Spring-extend |
| $\pm 0.100"$ | Air- or spring-extend |
| $\pm 0.200"$ | Spring-extend |

Common Specifications

| | |
|--|---|
| Input Frequency | 2.5 to 10 kHz |
| Linearity | $\leq \pm 0.20\%$ of full range output |
| Repeatability | 0.000004" (0.10 μ m) |
| Operating Temp. Range | -40°F to 160°F (-40°C to 70°C) |
| Temperature Coefficient of Sensitivity | $\pm 0.005\%$ of full range output/°F (±0.01% of full range output/°C) |
| Housing Material | High carbon, chromium heat treated tool steel |
| Cable | 6.5 feet (2 meters), 32 AWG stranded, PTFE insulated, shielded polyurethane jacket, 6 conductor |
| Cable Exit | Axial standard; adaptor provided with most units allows for radial exit |

Applications

- ☐ *Point-of-manufacture status of production process standards*
- ☐ *On-line inspection of automobile bodies*
- ☐ *Process feedback for numerically-controlled machine tools*
- ☐ *Automated data collection for factory SPC*
- ☐ *Robotics*



Spring-Extend Gage Heads



Air-Extend, Spring-Retract Gage Heads

LBB Series Gage Heads

±0.020" Range; Spring-Extend Design

Linear Ball Bearing Series

Ultra-Precision Performance

Linearity: ±0.20% FRO

AC-operated

Features

- ❑ *Ultra-precision performance*
- ❑ *AC-operated*
- ❑ *User-adjustable pretravel and overtravel settings*
- ❑ *0.315" (8 mm) or 0.375" (9.5 mm) body diameter*
- ❑ *Plain or threaded housing*
- ❑ *Calibration certificate supplied with every gage head*
- ❑ *Compatible with all Schaevitz® signal conditioners*
- ❑ *See pages 78-79 for common specifications*
- ❑ *7 connector options (see page 100)*

Electrical Specifications

| | |
|---------------------|----------------------------|
| Excitation | 3.5 V rms at 5.0 kHz (nom) |
| Sensitivity | 6.9 – 7.2 mV/V/.001" |
| Null Voltage | 2.0 mV (max) |
| Phase Shift | 6.5° ±3° |
| Primary Impedance | 405 ohms |
| Secondary Impedance | 1320 ohms |

Mechanical Specifications

| | |
|---------------|-------------------------------|
| Pretravel | 0.002" to 0.005" |
| Overtravel | 0.005" (min) |
| Probe Force | 2.47 oz (70g) nominal at null |
| Body Diameter | 0.315" or 0.375" |
| Body Type | Plain or threaded |
| Cable Length | 6.5' (2.0m) |
| Tip Thread | 2.5 mm |

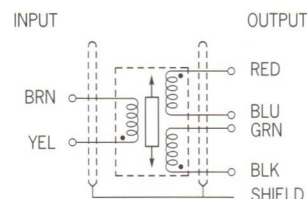
How to Order

Specify the appropriate model number followed by the desired connector number (see page 100). For example: LBB375PA-020-1.

| Model Number | Body Diameter | Housing |
|--------------|---------------|------------|
| LBB315PA-020 | 0.315" | Unthreaded |
| LBB375PA-020 | 0.375" | Unthreaded |
| LBB375TA-020 | 0.375" | Threaded |

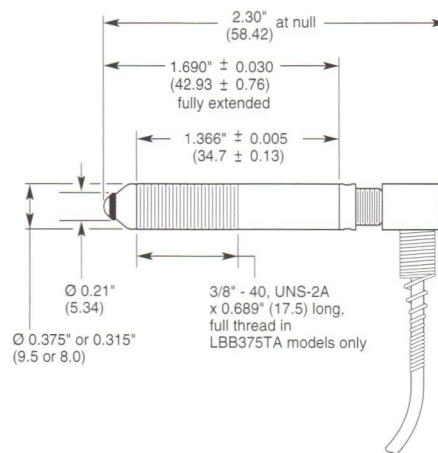


Wiring



Note:
BLU and GRN tied for differential output with YEL and BLK common. The output is in phase, with core displaced toward cable end. (Retract)

Dimensions in (mm)



LBB Series Gage Heads

±0.040" Range; Spring-Extend Design

Linear Ball Bearing Series

Ultra-Precision Performance

Linearity: ±0.20% FRO

AC-operated

Features

- ❑ *Ultra-precision performance*
- ❑ *AC-operated*
- ❑ *User-adjustable pretravel and overtravel settings*
- ❑ *0.315" (8.0 mm) or 0.375" (9.5 mm) body diameter*
- ❑ *Plain or threaded housing*
- ❑ *Calibration certificate supplied with every gage head*
- ❑ *Compatible with all Schaevitz® signal conditioners*
- ❑ *See pages 78-79 for common specifications*
- ❑ *7 connector options (see page 100)*
- ❑ *Special contact tips (see page 100)*



Electrical Specifications

| | |
|---------------------|----------------------------|
| Excitation | 3.5 V rms at 5.0 kHz (nom) |
| Sensitivity | 5.0 – 5.5 mV/V/.001" |
| Null Voltage | 5.0 mV (max) |
| Phase Shift | 3.0° ±3° |
| Primary Impedance | 960 ohms |
| Secondary Impedance | 2150 ohms |

Mechanical Specifications

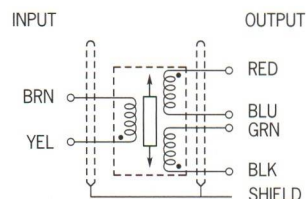
| | |
|---------------|-------------------------------|
| Pretravel | 0.002" to 0.005" |
| Overtravel | 0.005" (min) |
| Probe Force | 2.47 oz (70g) nominal at null |
| Body Diameter | 0.315" or 0.375" |
| Body Type | Plain or threaded |
| Cable Length | 6.5' (2.0m) |
| Tip Thread | 4-48 AGD |

How to Order

Specify the appropriate model number followed by the desired connector number (see page 100). For example: LBB315PA-040-1. Special contact tips are also available and can be ordered separately (see page 100).

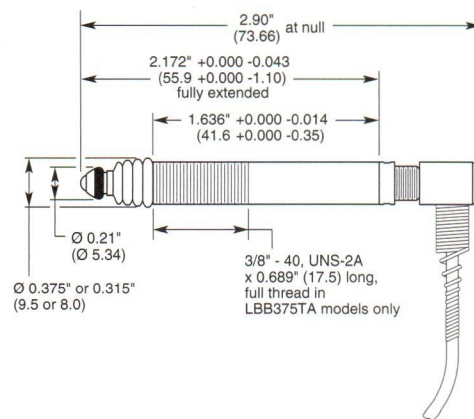
| Model Number | Body Diameter | Housing |
|--------------|---------------|------------|
| LBB315PA-040 | 0.315" | Unthreaded |
| LBB375PA-040 | 0.375" | Unthreaded |
| LBB375TA-040 | 0.375" | Threaded |

Wiring



Note:
BLU and GRN tied for differential output with YEL and BLK common.
The output is in phase, with core displaced toward cable end. (Retract)

Dimensions in (mm)



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SENSORS

LBB Series Gage Heads

±0.100" Range; Spring-Extend Design

Linear Ball Bearing Series

Ultra-Precision Performance

Linearity: ±0.20% FRO

AC-operated

Features

- ❑ *Ultra-precision performance*
- ❑ *AC-operated*
- ❑ *User-adjustable pretravel and overtravel settings*
- ❑ *0.315" (8 mm) or 0.375" (9.5 mm) body diameter*
- ❑ *Plain or threaded housing*
- ❑ *Calibration certificate supplied with every gage head*
- ❑ *Compatible with all Schaevitz® signal conditioners*
- ❑ *See pages 78-79 for common specifications*
- ❑ *7 connector options (see page 100)*
- ❑ *Special contact tips (see page 100)*

Electrical Specifications

| | |
|---------------------|----------------------------|
| Excitation | 3.5 V rms at 5.0 kHz (nom) |
| Sensitivity | 5.0 – 5.5 mV/V/.001" |
| Null Voltage | 5.0 mV (max) |
| Phase Shift | 3.0° ±3° |
| Primary Impedance | 960 ohms |
| Secondary Impedance | 2150 ohms |

Mechanical Specifications

| | |
|---------------|-------------------------------|
| Pretravel | 0.002" to 0.005" |
| Overtravel | 0.005" (min) |
| Probe Force | 2.47 oz (70g) nominal at null |
| Body Diameter | 0.315" or 0.375" |
| Body Type | Plain or threaded |
| Cable Length | 6.5' (2.0m) |
| Tip Thread | 4-48 AGD |

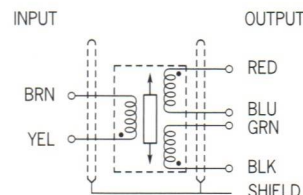
How to Order

Specify the appropriate model number followed by the desired connector number (see page 100). For example: LBB375PA-100-1. Special contact tips are also available and can be ordered separately (see page 100).

| Model Number | Body Diameter | Housing |
|--------------|---------------|------------|
| LBB315PA-100 | 0.315" | Unthreaded |
| LBB375PA-100 | 0.375" | Unthreaded |
| LBB375TA-100 | 0.375" | Threaded |

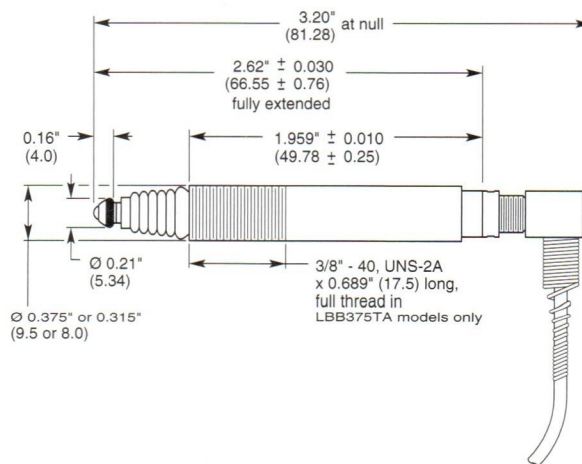


Wiring



Note:
BLU and GRN tied for differential output with YEL and BLK common.
The output is in phase, with core displaced toward cable end. (Retract)

Dimensions in (mm)



LBB Series Gage Heads

±0.100" Range; Air-Extend Design

Linear Ball Bearing Series

Ultra-Precision Performance

Linearity: ±0.20% FRO

AC-operated

Features

- ❑ Ultra-precision performance
- ❑ AC-operated
- ❑ 0.375" (9.5 mm) plain or threaded housing
- ❑ Variable probe force
- ❑ Calibration certificate supplied with every gage head
- ❑ Compatible with all Schaevitz® signal conditioners
- ❑ See pages 78-79 for common specifications
- ❑ 7 connector options (see page 100)
- ❑ Special contact tips (see page 100)



Electrical Specifications

| | |
|---------------------------|----------------------------|
| Excitation | 3.5 V rms at 2.5 kHz (nom) |
| Sensitivity | 2.5 mV/V/.001" |
| Null Voltage | .0 mV (max) |
| Phase Shift | ±20° |
| Primary Impedance | 260 ohms |
| Secondary Impedance | 2159 ohms |

Mechanical Specifications

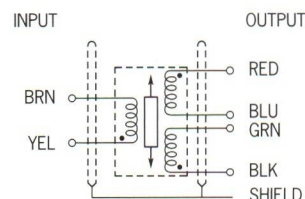
| | |
|---------------------|-------------------|
| Pretravel | 0.005" |
| Overtravel | 0.110" (min) |
| Probe Force | Variable |
| Body Diameter | 0.375" |
| Body Type | Plain or threaded |
| Cable Length | 6.5' (2.0m) |
| Tip Thread | 4-48 AGD |

How to Order

Specify the appropriate model number followed by the desired connector number (see page 100). For example: LBB375PA-100A-1. Special contact tips are also available and can be ordered separately (see page 100).

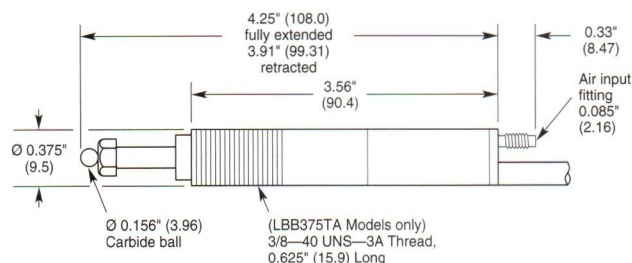
| Model Number | Body Diameter | Housing |
|---------------|---------------|------------|
| LBB375PA-100A | 0.375" | Unthreaded |
| LBB375TA-100A | 0.375" | Threaded |

Wiring



Note:
BLU and GRN tied for differential output with YEL and BLK common. The output is in phase, with core displaced toward cable end. (Retract)

Dimensions in (mm)



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LBB Series Gage Heads

±0.200" Range; Spring-Extend Design

Linear Ball Bearing Series

Ultra-Precision Performance

Linearity: ±0.20% FRO

AC-operated

Features

- ❑ *Ultra-precision performance*
- ❑ *AC-operated*
- ❑ *0.315" (8 mm) body diameter*
- ❑ *Plain housing*
- ❑ *Calibration certificate supplied with every gage head*
- ❑ *Compatible with all Schaevitz® signal conditioners*
- ❑ *See pages 78-79 for common specifications*
- ❑ *7 connector options (see page 100)*

How to Order

Specify the appropriate model number followed by the desired connector number (from page 100). For example: LBB315PA-200-1.

| Model Number | Body Diameter | Housing |
|--------------|---------------|------------|
| LBB315PA-200 | 0.315" | Unthreaded |

Electrical Specifications

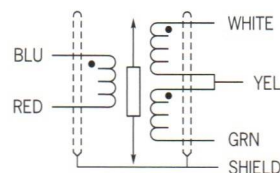
| | |
|--------------------|--------------------------|
| Excitation | 5 V rms at 5.0 kHz (nom) |
| Sensitivity | 4.3 mV/V/.001" |
| Null Voltage | 5.0 mV (max) |

Mechanical Specifications

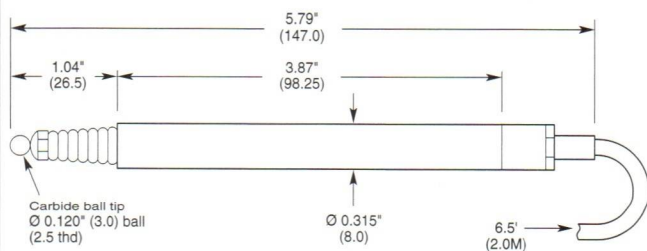
| | |
|---------------------|-------------------------------|
| Pretravel | 0.005" |
| Overtravel | 0.045" (min) |
| Probe Force | 4.4 oz (125g) nominal at null |
| Body Diameter | 0.315" |
| Body Type | Plain |
| Cable Length | 6.5' (2.0m) |
| Tip Thread | 2.5 mm |



Wiring



Dimensions in (mm)



PCA-499 Series Gage Head

±0.020" Range; Bi-Directional Lever Probe

PCA Series

Ultra-Precision Performance

Linearity: ±0.2% (Horizontal)

AC-operated

Features

- ❑ *Low contact force*
- ❑ *Positionable in any plane*
- ❑ *Eliminates need for fixtures*
- ❑ *AC-operated*
- ❑ *Adjustable gaging tip force*
- ❑ *Calibration certificate supplied with every gage head*
- ❑ *Compatible with all Schaevitz® signal conditioners*
- ❑ *7 connector options (see page 100)*

Designed primarily for use with a gage stand, Schaevitz® lever probes are ideally suited for quality control applications with "hard-to-reach" gaging requirements.

A universal joint protects the stylus of the unit and permits positioning in any plane. Bi-directional movement of the probe from side-to-side, as well as up and down, enable gaging of parts not necessarily aligned with the lever probe tip. In this way, dimensions in hard-to-reach places become measurable.

Lever probes are mounted from the dovetails on the top or back of the body using a standard mounting lug (supplied with each unit). The stylus is mounted in internal parallel reed-type flexures. Parallelogram construction keeps sensor movement perpendicular, eliminating cosine errors.

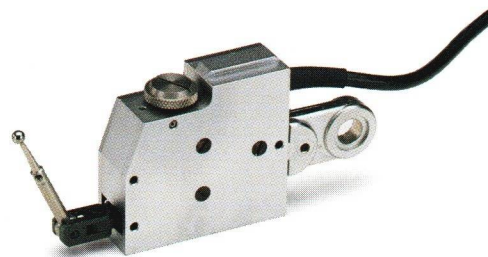
Two contact tips are provided with each lever probe: 1.16" and 2.16" (30 mm and 55 mm) which are adjustable for ±0.705 oz (±20 g) with up or down bias.

Electrical Specifications

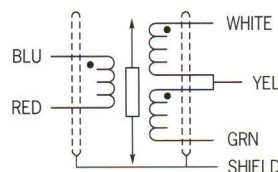
| | |
|----------------------------------|---|
| Excitation | 3.5 V rms (nom) |
| Input Frequency | 5 kHz (nom) |
| Sensitivity | 6 mV/.001"/V input (230 mV/mm/V input) |
| Phase Shift | 3.6° |
| Primary Impedance | 712 ohms at 5 kHz |
| Secondary Impedance | 8500 ohms at 5 kHz |

Mechanical Specifications

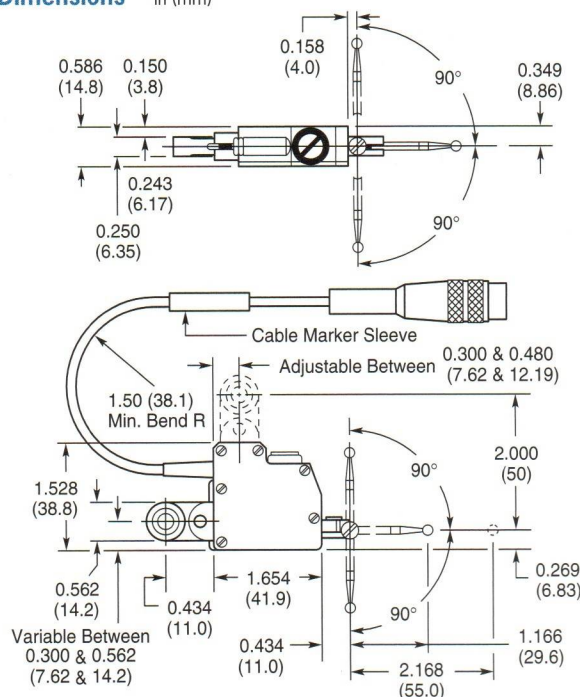
| | |
|--|--|
| Gaging Range | ±0.020" (±0.50 mm) |
| Linearity | ±0.2% at horizontal; 0.6% at ±45° from horizontal |
| Repeatability | 0.000010" (0.00025 mm) |
| Operating Temperature Range | 32°F to 104°F (0°C to 40°C) |
| Total Travel | 0.048" (1.22 mm) |
| Travel to Zero | 0.024" (0.6 mm) |
| Probe Force | ±0.705 oz (±20 g) adjustable |
| Cable Length | 6.5' (2.0m) |
| Weight | 6 oz (170 g) |



Wiring



Dimensions in (mm)



How to Order

Specify model number PCA-499 followed by the desired connector number (see page 100). For example: PCA-499-1.

| | |
|---------------------|---------|
| Model Number | PCA-499 |
|---------------------|---------|

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SENSORS

GCA/GCD Series Precision Gage Heads

Spring-Loaded Design for $\pm 0.050"$ to $\pm 2.00"$ Range Measurement

Features

- ❑ CE compliant (DC models)
- ❑ All-welded construction
- ❑ Resistant to harsh environments
- ❑ MS-type connector
- ❑ Electronics hermetically sealed
- ❑ Calibration certificate supplied with every gage head
- ❑ Compatible with all Schaevitz® signal conditioners
- ❑ Special contact tips (see page 100)

Applications

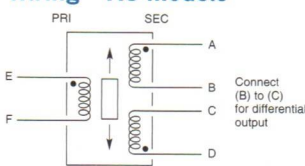
- ❑ In-process measurements to close loop with PLC or CNC controller
- ❑ Environments requiring hermetically sealed transducers
- ❑ High temperatures (300°F for AC units)

Stainless steel construction enables the GCA/GCD Series gage head to perform in environments containing moisture, dirt and other contaminants. Electronic components are hermetically sealed for added protection against hostile conditions. These are heavy duty, long stroke units with ranges up to $\pm 2.0"$ (50mm). Maximum spring force is typically 8 oz (226.8g), dependent upon probe position. The working end or probe has a removable chrome plated, hardened tool steel tip threaded to the probe with a 4-48 UNF-2A threading. Schaevitz® replacement and alternate contact tips are available (see page 100). Tips are also interchangeable with AGD dial indicator tips.

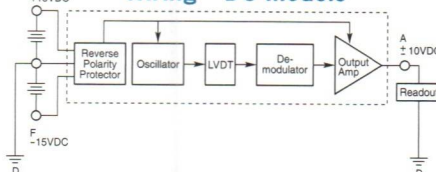
Internal construction prevents the core and shaft from rotating as they move longitudinally. Units terminating into connectors allow for easy cable replacement if damage should occur. Installation and adjustment are facilitated by external threading; locknuts are provided.

GCA/GCD Series gage heads are available in AC and DC versions. AC-operated units utilize external signal conditioning (see the Instrumentation section of this catalog); DC-operated units incorporate the core, LVDT and all necessary electronics in one housing. Use of monolithic, surface mount circuitry eliminates most of the volume, weight and cost of conventional AC excitation, amplification and demodulation equipment.

Wiring - AC Models



Wiring - DC Models



Increased side loading capability

General Specifications

AC-Operated models

| | |
|------------------------|-----------------------------------|
| Excitation | 3 V rms (nom) |
| Frequency Range | 400 Hz to 10 kHz |
| Null Voltage | Less than 0.5% full scale output |
| Linearity | $\pm 0.25\%$ of full range output |
| Repeatability | 0.000025" (0.0006 mm) |
| Operating Temperature | -65°F to 300°F |
| Range | (-55°C to 150°C) |
| Shock Survival | 1000 g for 11 milliseconds |
| Vibration Tolerance | 20 g up to 2 kHz |
| Housing Material | AISI 400 series stainless steel |
| Electrical Termination | 6-pin connector |

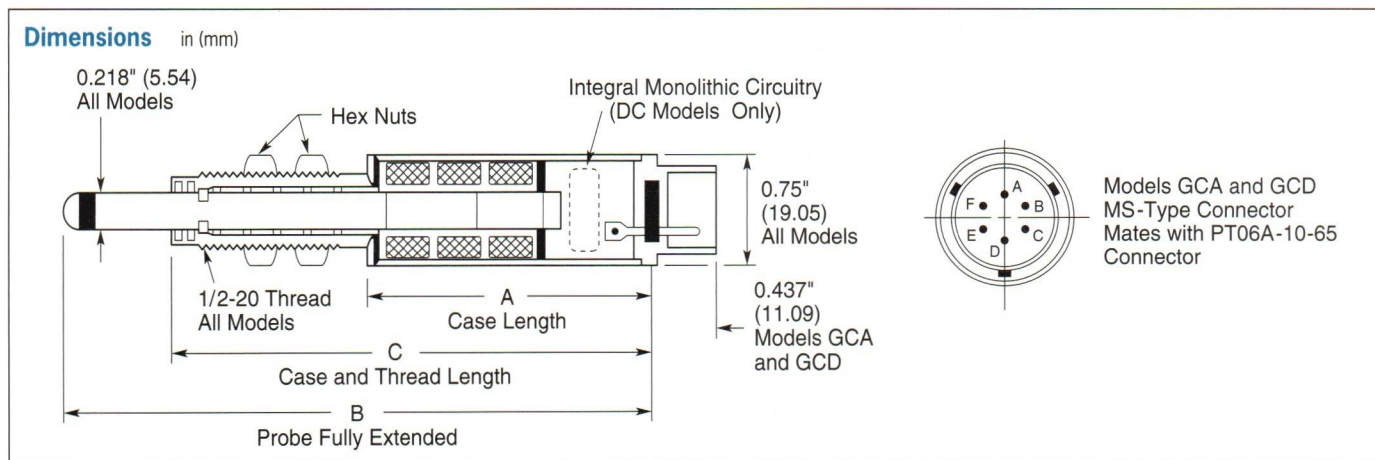
DC-Operated models

| | |
|------------------------|-----------------------------------|
| Excitation | ± 15 VDC ± 30 mA max |
| Null Voltage | 0 VDC |
| Linearity | $\pm 0.25\%$ of full range output |
| Repeatability | 0.000025" (0.0006 mm) |
| Operating Temperature | 32°F to 160°F |
| Range | (-0°C to 70°C) |
| Shock Survival | 250 g for 11 milliseconds |
| Vibration Tolerance | 10 g up to 2 kHz |
| Housing Material | AISI 400 series stainless steel |
| Electrical Termination | 6-pin connector |

How to Order

Specify the appropriate model number, followed by the desired Gaging Range suffix. For example: GCA-121-050 is AC operated with a $\pm 0.050"$ range. Special contact tips are also available and can be ordered separately (see page 100).

| Model Number | Operation | Gaging Range | Description |
|--------------|-----------|--------------|------------------------|
| GCA-121 | AC | 050 | $\pm 0.050"$ (1.27 mm) |
| | | 125 | $\pm 0.125"$ (3.17 mm) |
| | | 250 | $\pm 0.250"$ (6.35 mm) |
| | | 500 | $\pm 0.50"$ (12.7 mm) |
| | | 1000 | $\pm 1.00"$ (25.4 mm) |
| | | 2000 | $\pm 2.00"$ (50.8 mm) |
| GCD-121 | DC | | |



GCA Specifications @ 2.5 kHz – AC-Operated Models

| Model Number | GCA-121-050 | GCA-121-125 | GCA-121-250 | GCA-121-500 | GCA-121-1000 | GCA-121-2000 |
|---------------------------------|---|---|---|---|---|--|
| Gaging Range | $\pm 0.050"$ ($\pm 1.27\text{mm}$) | $\pm 0.125"$ ($\pm 3.17\text{mm}$) | $\pm 0.250"$ ($\pm 6.35\text{mm}$) | $\pm 0.500"$ ($\pm 12.7\text{mm}$) | $\pm 1.000"$ ($\pm 25.4\text{mm}$) | $\pm 2.00"$ ($\pm 50.8\text{mm}$) |
| Phase Shift | $+6^\circ$ | $+5^\circ$ | $+5^\circ$ | $+2^\circ$ | $+1^\circ$ | -1° |
| Sensitivity (mV/V/0.001") | 4.2 | 2.4 | 1.6 | 1.1 | 0.84 | 0.34 |
| Impedance (Ohms) | | | | | | |
| Primary | 430 | 1710 | 800 | 900 | 900 | 525 |
| Secondary | 950 | 1820 | 940 | 1150 | 2100 | 535 |
| Pretravel (Nominal) | 0.26" (6.6mm) | 0.30" (7.6mm) | 0.06" (1.5mm) | 0.18" (4.5mm) | 0.01" (0.3mm) | 0.1" |
| Minimum Overtravel | 0.15" (3.8mm) | 0.15" (3.8mm) | 0.15" (3.8mm) | 0.20" (5.1mm) | 0.10" (2.5mm) | 0 |
| Spring Load Over | 3.5 to 5.8 oz. | 3.5 to 5.8 oz. | 3.5 to 5.8 oz. | 3.2 to 8.0 oz. | 3.2 to 8.0 oz. | 3.2 to 8.0 oz. |
| Gaging Range | (99 to 164g) | (99 to 164g) | (99 to 164g) | (91 to 227g) | (91 to 227g) | (91 to 227g) |
| Dimensions | | | | | | |
| A ($\pm 0.01"/0.25\text{mm}$) | 1.90" (48.3mm) | 2.75" (69.9mm) | 3.61" (91.7mm) | 5.29" (134.4mm) | 7.55" (191.8mm) | 10.89" (276.6mm) |
| B ($\pm 0.03"/0.76\text{mm}$) | 4.33" (110.0mm) | 5.14" (130.6mm) | 6.10" (154.9mm) | 10.75" (273.1mm) | 13.01" (330.5mm) | 20.94" (531.9mm) |
| C ($\pm 0.02"/0.50\text{mm}$) | 3.27" (8.1mm) | 4.12" (104.6mm) | 4.99" (126.7mm) | 8.27" (210.1mm) | 10.53" (267.5mm) | 16.37" (415.8mm) |
| Weight | 2.2 oz (64g) | 2.9 oz. (82g) | 3.17 oz. (90g) | 5.0 oz. (142g) | 7.5 oz. (213g) | 13 oz. (369g) |

GCD Specifications – DC-Operated Models

| Model Number | GCD-121-050 | GCD-121-125 | GCD-121-250 | GCD-121-500 | GCD-121-1000 | GCD-121-2000 |
|---------------------------------|---|---|---|---|---|---|
| Gaging Range | $\pm 0.050"$ ($\pm 1.27\text{mm}$) | $\pm 0.125"$ ($\pm 3.17\text{mm}$) | $\pm 0.250"$ ($\pm 6.35\text{mm}$) | $\pm 0.500"$ ($\pm 12.7\text{mm}$) | $\pm 1.000"$ ($\pm 25.4\text{mm}$) | $\pm 2.000"$ ($\pm 50.8\text{mm}$) |
| Sensitivity (V/1") | 200 | 80 | 40 | 20 | 10 | 5 |
| Pretravel (Nominal) | 0.30" (7.62mm) | 0.35" (8.8mm) | 0.18" (4.5mm) | 0.20" (5.08mm) | 0.01" (.25mm) | 0.1" |
| Minimum Overtravel | 0.39" (9.4mm) | 0.14" (3.5mm) | 0.03" (0.76mm) | 1.00" (25.4mm) | 0.10" (2.5mm) | 0 |
| Spring Load Over | 3.5 to 5.8 oz. | 3.5 to 5.8 oz. | 3.5 to 5.8 oz. | 3.2 to 8.0 oz. | 3.2 to 8.0 oz. | 3.2 to 8.0 oz. |
| Gaging Range | (99 to 164g) | (99 to 164g) | (99 to 164g) | (91 to 227g) | (91 to 227g) | (91 to 227g) |
| Dimensions | | | | | | |
| A ($\pm 0.01"/0.25\text{mm}$) | 2.66" (67.6mm) | 3.50" (88.9mm) | 4.37" (111.0mm) | 6.06" (153.9mm) | 8.31" (211.1mm) | 11.48" (291.6mm) |
| B ($\pm 0.03"/0.76\text{mm}$) | 5.08" (129.0mm) | 5.90" (149.9mm) | 6.77" (172.0mm) | 11.53" (292.9mm) | 13.76" (349.5mm) | 21.52" (546.6mm) |
| C ($\pm 0.02"/0.50\text{mm}$) | 4.02" (102.1mm) | 4.87" (123.7mm) | 5.74" (145.8mm) | 9.05" (229.9mm) | 11.29" (286.8mm) | 16.96" (430.8mm) |
| Weight | 2.5 oz. (71g) | 3.2 oz. (93g) | 3.5 oz. (100g) | 5.5 oz. (156g) | 8.0 oz. (227g) | 14 oz. (397g) |

GCD-SE Series Precision Gage Heads

Spring-Loaded Design for 0.100" to 2.00" Range Measurement

The NEW GCD-SE is available in five unipolar measurement ranges, with standard strokes from 0 to 0.1 inch to 0 to 2.0 inches. Operating on a single ended 8.5 to 28.0 volt dc. input, and minimal current draw, the GCD-SE is ideally suited to portable measurement applications. Hermetically sealed, the GCD-SE is also well suited to in-process wet grinding and machining applications.

Internal regulation provides immunity from output sensitivity to input voltage fluctuation and ripple. Internal EMI, ESD and RFI protection, provide CE compliance when correctly installed. Incorporation of a new oscillator design provides exceptional output stability over a wide range of operating temperatures. Synchronous demodulation insures unsurpassed noise rejection.

Features

- ❑ **CE compliance**
- ❑ **Heavy-duty, all-welded construction**
- ❑ **Unipolar ranges: 0.1" to 2.0"**
- ❑ **8.5 to 28 VDC operation**
- ❑ **Low power consumption**
- ❑ **May be battery operated**
- ❑ **0 to 5 and 1 to 6 VDC outputs**
- ❑ **New heavy duty front end**
- ❑ **Hermetically sealed design**

Options

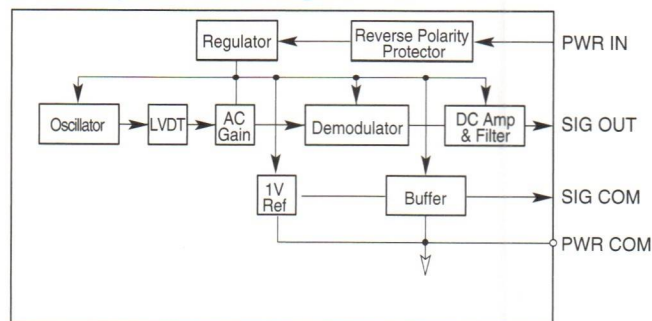
- ❑ **Special contact tips**
- ❑ **Mating connector**



Applications

- ❑ **Roller gap control**
- ❑ **In-process wet grinding**
- ❑ **Hand held gages**
- ❑ **X-Y positional feedback**

GCD-SE System Block Diagram

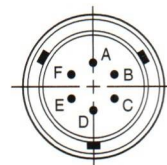
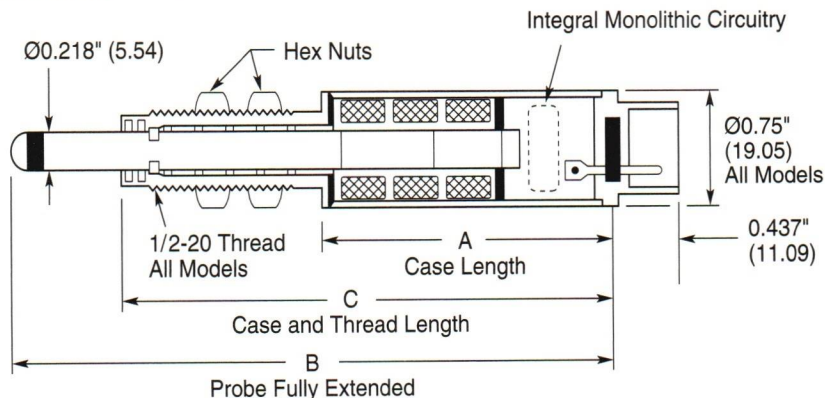


How to Order

Specify the model name, followed by the desired Gaging Range suffix. For example: GCD-SE-100 is AC operated with a 0.100" range. Special contact tips are also available and can be ordered separately (see page 100).

| Model Number | Operation | Gaging Range | Description |
|--------------|-----------|--------------|------------------|
| GCD-SE | DC | 100 | 0.100" (2.54 mm) |
| | | 250 | 0.250" (6.35 mm) |
| | | 500 | 0.50" (12.7 mm) |
| | | 1000 | 1.00" (25.4 mm) |
| | | 2000 | 2.00" (50.8 mm) |

Dimensions in (mm)



Connector Mates with
PT06A-10-65
(SR) Connector

A = 0-5 VDC or 1-6 VDC
B = N/C
C = Power Common
D = Sig Common
E = 8.5 to 28 VDC
F = N/C

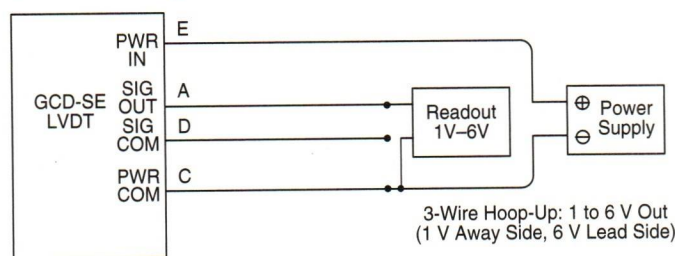
GCD Specifications – DC-Operated Models

| Model Number | GCD-SE-100 | GCD-SE-250 | GCD-SE-500 | GCD-SE-1000 | GCD-SE-2000 |
|---------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Gaging Range | 0.100" (2.54mm) | 0.250" (6.35mm) | 0.500" (12.7mm) | 1.000" (25.4mm) | 2.000" (50.8mm) |
| Scale Factor | 50 | 20 | 10 | 5 | 2.5 |
| Pretravel (Nominal) | 0.30" (7.6mm) | 0.28" (7.1mm) | 0.18" (4.5mm) | 0.20" (5.08mm) | 0.10" (2.5mm) |
| Overtravel | 0.39" (9.4mm) | 0.29" (7.4mm) | 0.03" (0.8mm) | 0.35" (8.9mm) | 0.10" (2.5mm) |
| Dimensions | | | | | |
| A (±0.01"/0.25mm) | 4.06" (103.1mm) | 4.90" (124.5mm) | 5.76" (146.3mm) | 7.46" (189.5mm) | 9.71" (246.6mm) |
| B (±0.03"/0.76mm) | 6.48" (164.6mm) | 7.30" (185.4mm) | 8.16" (207.3mm) | 12.93" (328.4mm) | 15.16" (385.1mm) |
| C (±0.02"/0.50mm) | 5.42" (137.7mm) | 6.27" (159.3mm) | 7.13" (181.1mm) | 10.45" (265.4mm) | 12.69" (322.3mm) |

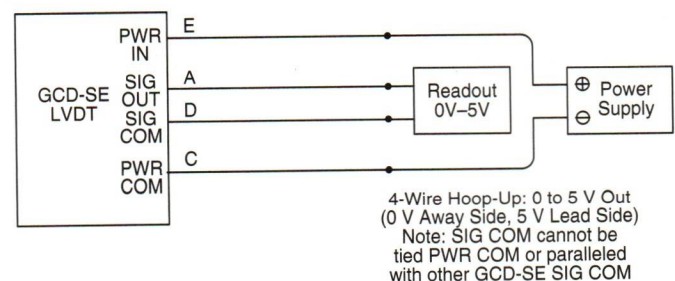
General Specifications

| | |
|-----------------------|---|
| Input Voltage | 8.5 to 28 VDC |
| Input Current | 6 mA nominal |
| Line Regulation | 0.2 mV/V (typical) |
| Operating Temperature | -13°F to 185°F |
| Range | (-25°C to 85°C) |
| Storage Temperature | -65°F to 200°F |
| Range | (-55°C to 95°C) |
| Output Voltage | 0 to 5 VDC (4-wire); 1 to 6 VDC (3-wire) |
| Output Impedance | < 1Ω |
| Noise and Ripple | <10 mV Rms |
| Linearity | ≤0.25% full range |
| Repeatability | 0.000025 in (0.0006 mm) |
| Stability | 0.1% full range |
| T/C of Scale Factor | 0.025%/°F max (0.05%/°C max) |
| Shock Survival | 250 g for 11 milliseconds |
| Vibration Tolerance | 10 g up to 2 kHz |
| Housing Construction | TIG welded 400 series stainless steel |
| Termination | 6-pin MS style hermetic connector |

3-Wire Hook-Up

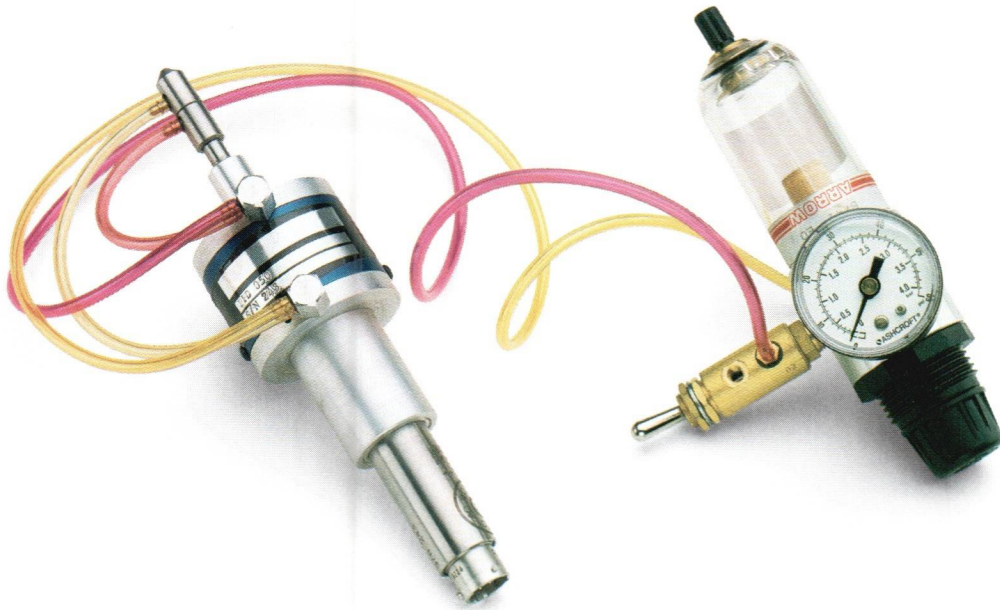


4-Wire Hook-Up



PPA/PPD Series Precision Gage Heads

Non-Contacting Design for $\pm 0.050"$ to $\pm 1.00"$ Range Measurement



The Schaevitz® non-contacting gage head consists of an LVDT and a pneumatic servo which maintains a constant space between the work piece and a nozzle follower. The LVDT measures the nozzle displacement as it tracks the profile of the part and converts this movement to an electrical signal that is directly proportional to thickness. The LVDT inherently has high accuracy, excellent repeatability, infinite resolution, and high sensitivity; directly coupling the LVDT core to the nozzle follower results in a mechanism without cams, linkages or other similar moving parts to affect the measurement.

The Schaevitz® design overcomes the limitations of other thickness measurement devices. Contacting devices can mar or tear fragile material; proximity devices have very limited range and only work on ferrous or conductive materials. Optics require reflective surfaces for operation; capacitance units are affected by humidity; nuclear-type devices work only on material with constant density; and the range of measurement of air gages is very small. In contrast to these limitations, Schaevitz® non-contacting gage heads accurately measure the physical variables (such as thickness, height, diameter, etc.) of materials without surface contact.

Probes can follow any combination of change in surface thickness (displacement) versus frequency (speed of work piece) to a maximum of $0.125"/\text{sec}$. ($3.17 \text{ mm}/\text{sec}$). Accuracy improves as displacement and/or frequency decreases. These gage heads permit accurate measurement of such diversified materials as metal, plastic, paper and film. Units gage over a range of $\pm 0.050"$ to $\pm 1.00"$ ($\pm 1.27 \text{ mm}$ to 25.4 mm).

Our non-contacting gage heads are manufactured as Standard or Booster configurations. Standard configurations are ideal for general applications with

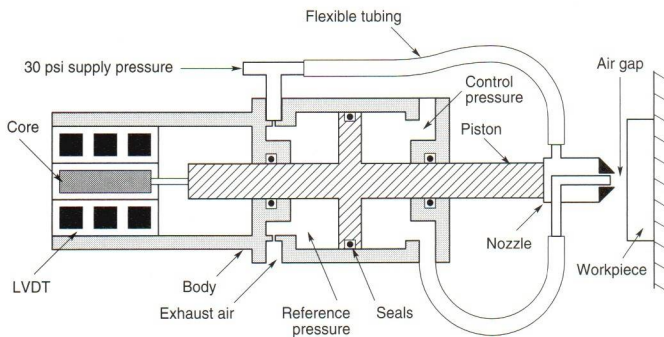
material that can tolerate a gaging force of up to 15 to 20 grams. In this unit, the nozzle-to-surface gap is $0.003"$. Booster units offer a large air gap ($0.015"$) for applications involving delicate materials. The booster functions as an amplifier for detection of thickness changes at greater nozzle-to-surface spacing.

Features

- ☐ **High sensitivity resolves changes in thickness to $0.0001"$**
- ☐ **Wide measurement range for thickness variations to $\pm 1.000"$**
- ☐ **Low air-flow requirement eliminates need for precision air regulation**
- ☐ **Calibration certificate supplied with every gage head**
- ☐ **Compatible with all Schaevitz® signal conditioners**
- ☐ **Non-contacting; never contacts part being gaged**
- ☐ **Low gaging force down 1 gram**
- ☐ **Rugged simple construction with only one moving part**
- ☐ **Easily cleaned; not affected by dirt**

Applications

- ☐ **Delicate materials**
- ☐ **Metals, plastics and films that scratch easily**



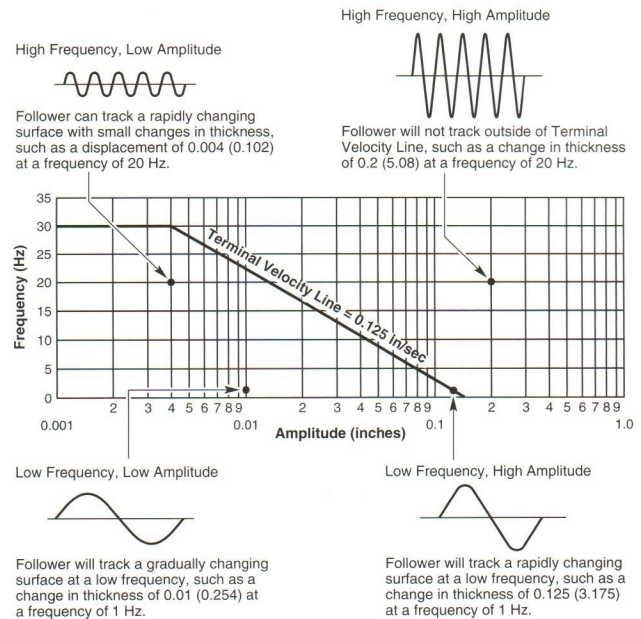
Simplified cross-section of pneumatic servo-follower coupled to LVDT.

The Schaevitz® non-contacting gage head consists of a double acting air cylinder with a pneumatic servo-follower nozzle on one end and an LVDT on the other. The double acting cylinder combined with the closed-loop servo mechanism of the follower nozzle maintains a constant air gap between the work piece and the gage head; any repositioning of the nozzle to maintain the air gap constant is translated by the LVDT into an electrical signal that is directly proportional to the variation in thickness of the work piece.

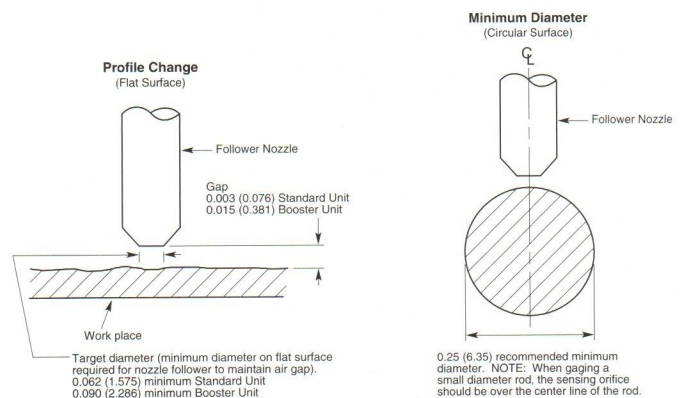
Compressed air, regulated to approximately 30 psi, is applied to the reference pressure chamber through the supply air inlet orifice. The supply air is also connected to the nozzle, where it bleeds to atmosphere through the sensing orifice. The nozzle is designed so that a back pressure, developed by the discharging supply air, varies with the gap between the sensing orifice and the surface being measured. This gap-dependent pressure is fed back to the control pressure chamber.

At a particular gap, typically 0.003 inches, the control pressure on one side of the piston equals the reference pressure on the other side, and the piston does not move. If the gap changes because of dimensional or positional changes in the gaged surface, the control pressure changes accordingly, repositioning the piston and nozzle and restoring the gap. For example, if the air gap becomes smaller due to greater thickness of the work piece, the nozzle back pressure increases, and the piston and nozzle assembly will move to re-establish the original back pressure. It is this change in position that the direct-coupled LVDT converts to an analog signal, directly proportional to nozzle displacement.

Units are available in AC or DC-operated versions to meet particular system requirements. AC-operated units utilize external signal conditioning; DC units incorporate all the necessary signal conditioning within the housing of the gage head.



Standard Schaevitz® LVDT non-contacting gage heads can follow any combination of change in surface thickness (displacement) vs. frequency (speed of work piece) to a maximum of 0.125 in/sec. Accuracy improves as displacement and/or frequency decrease.



Accuracy of the Schaevitz® non-contacting gage depends on many variables: speed of work piece, shape and size of particles (i.e. sandpaper or grinding wheels), slope or profile change of work piece, and target area.

PPA/PPD Series Precision Gage Heads

Non-Contacting Design for $\pm 0.050"$ to $\pm 1.00"$ Range Measurement

Specifications

| | |
|------------------------------------|---|
| Excitation | AC version: 5 V rms (nom) DC version: $\pm 15\text{VDC}$, $\pm 30\text{mA}$ (max) |
| Input Air Pressure | 30 psi (nom) |
| Air Flow | Standard: 0.2 cfm Booster: 0.4 cfm |
| Gaging Range | 0.05" to $\pm 1.0"$ (± 1.27 mm to ± 25.4 mm) |
| Linearity | $\pm 0.25\%$ FRO |
| Repeatability | Standard: 0.0001" with 0.002" air gap (.00025 mm with 0.05 mm air gap) Booster: 0.0002" with 0.015" air gap (0.005 mm with 0.38 mm air gap) |
| Operating Temperature Range | AC version: 0°F to 160°F (-18°C to 70°C) DC version: 32°F to 160°F (0°C to 70°C) |
| Gaging Force | Standard: 15 to 20 g Booster: 1 to 2 g |
| Housing Material | LVDT housing: 400 series stainless steel; servo housing: aluminum |

AC Operated*

| Gaging Range (in) | Impedance (ohms) @ 2.5 kHz | | Output Sensitivity (mV/0.001"/V input) 2.5 kHz | Linearity (% Full Range) |
|-------------------|----------------------------|--------|--|--------------------------|
| | Input | Output | | |
| ± 0.050 | 430 | 950 | 4.2 | ± 0.25 |
| ± 0.125 | 1,710 | 1,820 | 2.4 | ± 0.25 |
| ± 1.000 | 900 | 2,100 | 0.84 | ± 0.25 |

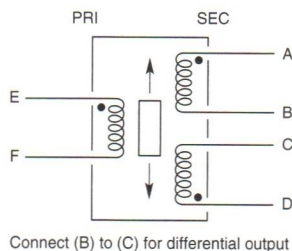
*5V rms nominal input

DC Operated*

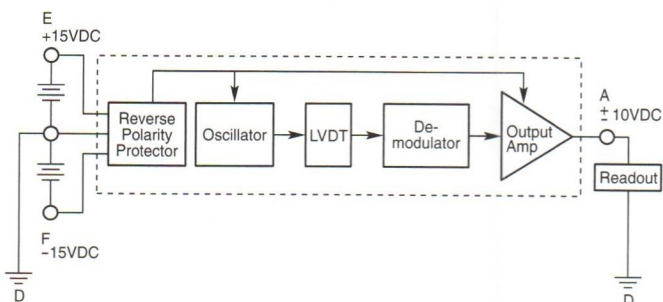
| Gaging Range (in) | Output | Output Impedance (ohms) | Min. Load Resistance (k ohms) | Linearity (% Full Range) |
|-------------------|-------------------------|-------------------------|-------------------------------|--------------------------|
| | | | | |
| ± 0.050 | ± 10 VDC full scale | 100 | 2 | ± 0.24 |
| ± 0.125 | ± 10 VDC full scale | 100 | 2 | ± 0.25 |
| ± 1.000 | ± 10 VDC full scale | 100 | 2 | ± 0.25 |

* ± 15 VDC nominal input, ± 20 mA

Wiring – AC Models

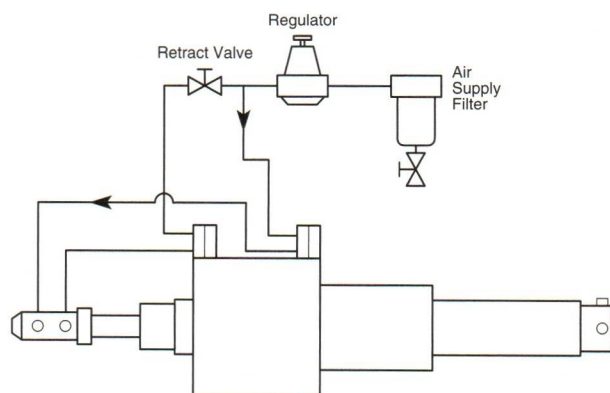


Wiring – DC Models



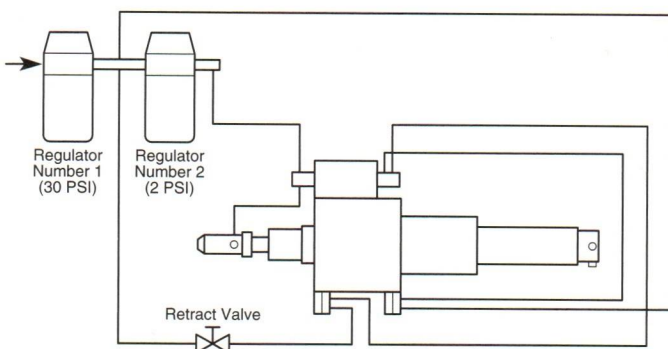
Standard Model

For general applications with material that can tolerate a gaging force of up to 15–20 grams. In this unit, the nozzle-to-surface gap is 0.003 inch, and the gaging range is equal to the total mechanical stroke.



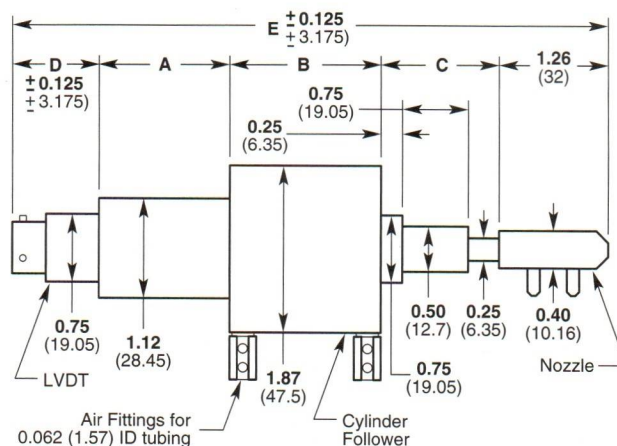
Booster Model

Larger air gap (0.015 inch) for those applications involving delicate materials which require a maximum gaging force of 2 grams. The booster functions as an amplifier which allows detection of thickness changes at greater nozzle-to-surface spacing. As in the standard unit, the gaging range is equal to the total mechanical stroke.

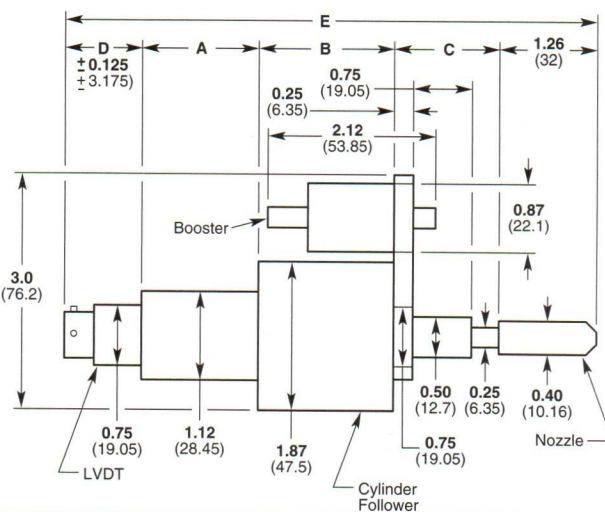


Dimensions in (mm)

Standard Models



Booster Models



Standard and Booster Models

| Model Number | Operation | Range | A | B | C | D | E |
|--------------|-----------|------------------|------|------|------|------|-------|
| PPA-050 | AC | ±0.050" (1.27mm) | 1.50 | 1.75 | 1.37 | 1.05 | 6.87 |
| PPA-125 | AC | ±0.125" (3.18mm) | 1.50 | 1.75 | 1.37 | 1.87 | 7.75 |
| PPA-100 | AC | ±1.00" (25.4mm) | 5.25 | 3.50 | 3.12 | 4.75 | 17.87 |
| PPD-050 | DC | ±0.050" (1.27mm) | 1.50 | 1.75 | 1.37 | 1.80 | 7.62 |
| PPD-125 | DC | ±0.125" (3.18mm) | 1.50 | 1.75 | 1.37 | 3.62 | 8.50 |
| PPD-100 | DC | ±1.00" (25.4mm) | 5.25 | 3.50 | 3.12 | 5.50 | 18.62 |

How to Order

Specify the appropriate model number followed by the desired standard or booster configuration suffix (S – Standard; B – Booster). For example: PPA-050-S.

| Model Number | Operation | Range |
|--------------|-----------|------------------|
| PPA-050 | AC | ±0.050" (1.27mm) |
| PPA-125 | AC | ±0.125" (3.18mm) |
| PPA-1000 | AC | ±1.00" (25.4mm) |
| PPD-050 | DC | ±0.050" (1.27mm) |
| PPD-125 | DC | ±0.125" (3.18mm) |
| PPD-100 | DC | ±1.00" (25.4mm) |

Ultra Tough Design for $\pm 0.250"$ and $\pm 1.00"$ Range Measurements

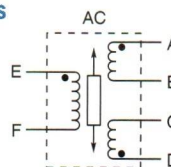
- ☐ *Resists hostile environments*
- ☐ *Hermetically sealed*
- ☐ *Long life*
- ☐ *Heavy side loads*
- ☐ *Calibration certificate supplied with every gage head*
- ☐ *AC or DC operated*
- ☐ *AC units compatible with all Schaevitz® signal conditioners*
- ☐ *DC units have built-in signal conditioning*
- ☐ *Special contact tips (see page 100)*
- ☐ *Seven connector options (see page 100)*

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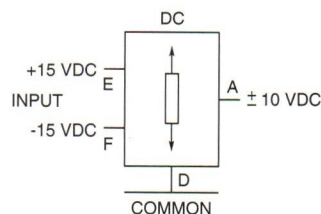
AC-Operated Units (2.5 kHz)

| Model Number | 250 RBB-A | 1000 RBB-A |
|---------------------------|------------------------|----------------------|
| Gaging Range | $\pm 0.250''$ | $\pm 1.000''$ |
| Sensitivity (mV/V/0.001") | 1.6 | .84 |
| Phase Shift | $+5^\circ$ | $+1^\circ$ |
| Primary Impedance (ohm) | 800 | 900 |
| Secondary Impedance (ohm) | 940 | 2100 |
| Probe Force (at null) | 3-1/2 lbs (1,587 g) | 7 lbs (3,175 g) |
| Dimensions | | |
| A | 5.58" (141.7 mm) | 12.21" (310.1 mm) |
| B | 6.38" (162.1 mm) | 14.85" (377.2 mm) |
| Weight | | |
| | 14 oz (397 g) | 26 oz (737 g) |

Wiring – AC Models



Wiring – DC Models



DC-Operated Units

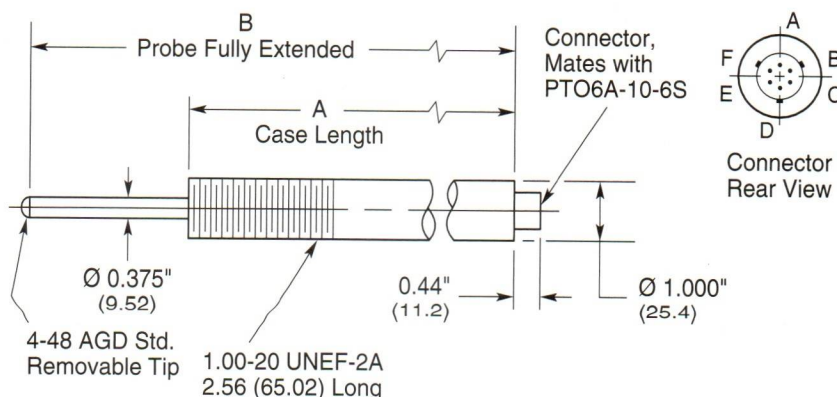
| Model Number | 250 RBB-D | 1000 RBB-D |
|-----------------------------|------------------------|----------------------|
| Gaging Range | $\pm 0.250''$ | $\pm 1.000''$ |
| Sensitivity – V/inch (V/mm) | 40 (1.6) | 10 (0.4) |
| Probe Force (at null) | 3-1/2 lbs (1,587 g) | 7 lbs (3,175 g) |
| Dimensions | | |
| A | 6.34" (161.0 mm) | 12.97" (329.4 mm) |
| B | 7.13" (162.1 mm) | 15.60" (396.2 mm) |
| Weight | | |
| | 15.4 oz (435 g) | 28 oz (794 g) |

How to Order

Specify by model number. Special contact tips are also available and can be ordered separately (see page 100).

| Model Number | Operation | Range |
|--------------|-----------|---------------|
| 250-RBB-A | AC | $\pm 0.250''$ |
| 1000-RBB-A | AC | $\pm 1.00''$ |
| 250-RBB-D | DC | $\pm 0.250''$ |
| 1000-RBB-D | DC | $\pm 1.00''$ |

Dimensions in (mm)



PCA375 PR-020 Gage Head

Ultra-Compact Design for ± 0.020 " Range Measurement

Features

- ☐ **Compact design**
- ☐ **Rugged Polyurethane cable**
- ☐ **90° cable exit**
- ☐ **Calibration certificate supplied with every gage head**
- ☐ **Compatible with all Schaevitz® signal conditioners**
- ☐ **7 connector options and special contact tips available (see page 100)**

Applications

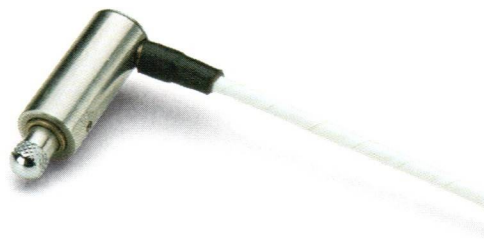
- ☐ **Bore gages**
- ☐ **Fixture gages**
- ☐ **Limited space**
- ☐ **Small inside diameters**

This ultra-compact device provides accurate measurement in areas with limited space. Designed with a radial cable exit, the gage head easily fits within miniature fixtures and small inside diameters. AC-operated, this ultra-compact gage head is compatible with Schaevitz® signal conditioners (see LVDT Instrumentation section of this catalog, page 111).

A spring-loaded probe with 2.5 oz (70.8 g) of force maintains constant contact with the part under measurement.

The ultra-compact gage head provides excellent stroke-to-size ratio due to its compact packing. A permanently lubricated, bronze bearing and plunger assembly provides long-term transducer repeatability.

With an LVDT as the heart of the sensor, resolution is only limited by the repeatability of the bearing system. An interchangeable 4-48 ADG standard dial gage contact tip is used.



Electrical Specifications

| | |
|----------------------------|---------------------------------|
| Linearity | Better than $\pm 0.25\%$ FRO |
| Excitation Voltage | 3.5 V rms (maximum) |
| Excitation Frequency | 5 kHz. (2.5 to 10 kHz. OK) |
| Sensitivity | 4.75 mV/V/0.001" at 5 kHz (min) |
| Phase Shift | +60° (nominal) |
| Primary Impedance | 94.5 ohms (nominal) |
| Secondary Impedance | 214 ohms (nominal) |

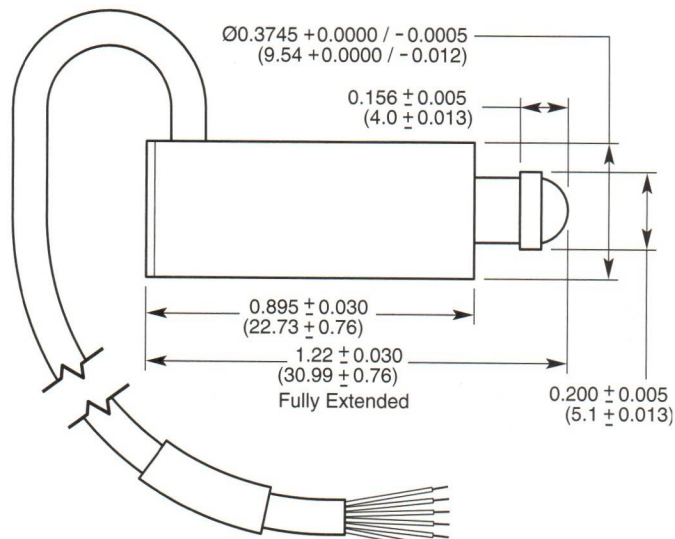
Mechanical Specifications

| | |
|-------------------------|--------------------------------------|
| Linear Range | ± 0.020 " (± 0.51 mm) |
| Pre-travel | 0.002" to 0.005" (0.05 to 0.13 mm) |
| Total Mechanical | |
| Stroke | 0.060" nom (1.52 mm) |
| Operating | |
| Temperature Range | 0°F to 250°F (-18°C to 121°C) |
| Repeatability | 0.00004" (0.01 mm) |
| Cable Length | 6.5 ft (2 m) |
| Housing Material | 304 stainless steel |
| Probe Force | 2.57 oz (72.8 g) at 50% probe extend |
| Contact Tip | 4-48 ADG |

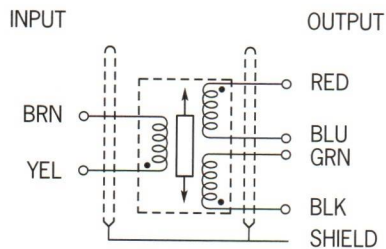
How to Order

Specify the model number PCA375PR-020 followed by the desired connector number (see page 100).

Dimensions in (mm)



Wiring



Note:
 BLU and GRN tied for differential output with YEL and BLK common.
 The output is in phase, with core displaced toward cable end. (Retract)

PCA-116 Series Economy Gage Heads

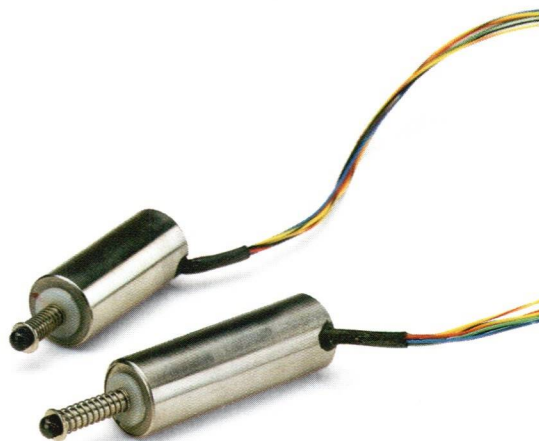
Cost-Effective Performance for $\pm 0.10''$ to $\pm 0.30''$ Range Measurement

Features

- ☐ **Cost effective performance**
- ☐ **Good reliability**
- ☐ **AC operated**
- ☐ **Compatible with all Schaevitz® signal conditioners**
- ☐ **Special contact tips (see page 100)**

Applications

- ☐ **Moderate cost units are ideal for less demanding applications**



Our PCA-116 family of gage heads was developed for less demanding applications where a balance between cost and performance is paramount.

PCA-116 gage heads incorporate a standardized LVDT with repeatability better than 0.0001" (0.0025 mm) and linearity within 0.5% of full range output. The probe shaft is externally sprung and is carried on low friction nylon sleeve bearings. The probe to bearing clearances are designed to minimize problems should contaminants get into the bore.

Units are supplied with replaceable hardened steel tips that thread to the probe with a 4-48 UNF-2 thread. Replacement or alternate tips are available (see page 100). Any 4-48 AGD dial indicator contact tip can also be used.

General Specifications

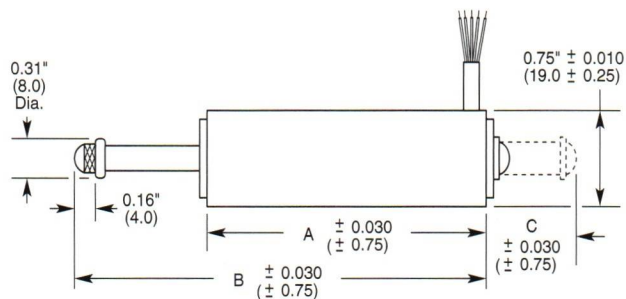
| | |
|------------------------|------------------------------------|
| Excitation | 3V rms (nom) |
| Null Voltage | $\leq 1.0\%$ FRO |
| Frequency Range | 50 Hz to 10 kHz |
| Linearity | $\leq 0.5\%$ FRO |
| Repeatability | 0.0001" (0.0025 mm) |
| Operating Temperature | |
| Range | -65°F to 200°F (-55°C to 95°C) |
| Probe Force | 8 oz (22.6 g) |
| Lead Length | 1 ft (0.3 m) 28 awg PTFE insulated |
| Housing Material | AISI 400 series stainless steel |

How to Order

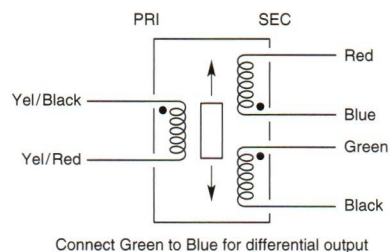
Specify the model number with the appropriate range. Special contact tips are also available and can be ordered separately (see page 100).

| Model Number | Range |
|--------------|----------------------|
| PCA-116-100 | $\pm 0.10''$ (2.5mm) |
| PCA-116-200 | $\pm 0.20''$ (5.1mm) |
| PCA-116-300 | $\pm 0.30''$ (7.6mm) |

Dimensions in (mm)



Wiring – AC Models



Specifications by Model (@ 2.5 kHz)

| Model Number | PCA-116-100 | PCA-116-200 | PCA-116-300 |
|---------------------------|------------------------------|------------------------------|------------------------------|
| Nominal Linear Range | $\pm 0.10''$ (± 2.5 mm) | $\pm 0.20''$ (± 5.0 mm) | $\pm 0.30''$ (± 7.5 mm) |
| Phase Shift | -3° | -5° | -8.5° |
| Sensitivity (mV/V/0.001") | 2.4 | 1.57 | 1.2 |
| Impedance (Ohm) | | | |
| Primary | 660 | 970 | 960 |
| Secondary | 960 | 1010 | 1005 |
| Pretravel | 0.10" (2.5 mm) | 0.08" (2.0 mm) | 0.02" (0.5 mm) |
| Overtravel | 0.03" (0.75 mm) | 0.09" (22.9 mm) | 0.08" (2.0 mm) |
| Weight | 1.5 oz (43 g) | 1.7 oz (50 g) | 2.01 oz (57 g) |
| Dimensions | | | |
| A | 1.75" (44.4 mm) | 2.25" (57.1 mm) | 2.77" (69.8 mm) |
| B | 2.54" (64.5 mm) | 3.30" (83.8 mm) | 4.10" (104.1 mm) |
| C | 0.44" (11.1 mm) | 0.69" (17.5 mm) | 0.88" (22.3 mm) |

Options and Accessories

See individual gage head
model specification pages
for compatibility

Connectors

Seven different connectors are available to simplify installation of LBB and PCA Series gaging probes, including the PCA Series Bi-directional Lever Probe. To select the proper connector, simply add the appropriate number to the end of the gage head part number. For example, by adding a 2 to a model number such as LBB375PA-020-2 allows the user to specify a standard sensitivity gage head with an Amphenol-type 126-195 connector.

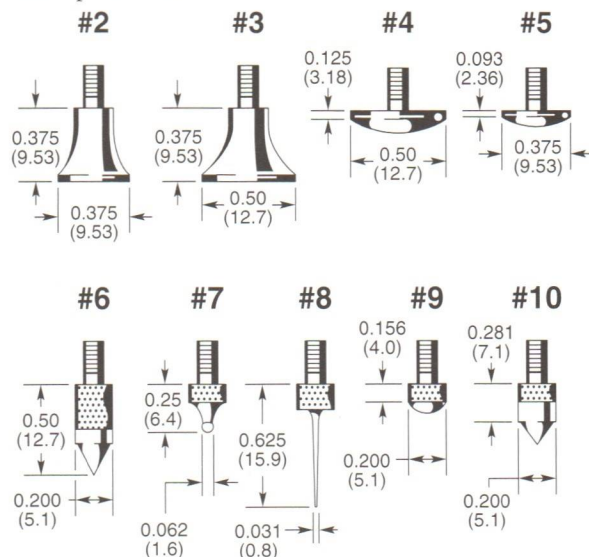


Connector Part Number

| Suffix | Description |
|--------|--|
| 1 | Bendix-type PTO6A-10-6P (SR) |
| 2 | Amphenol-type 126-195 |
| 3 | Amphenol-type 165-13 |
| 4 | DE-9 compatible with Schaevitz® ATA2001 |
| 5 | Switchcraft-type 12CL5-M compatible with Schaevitz® SYS-96 Dimensional Data Acquisition System |
| 6 | LEMO-type CONN. FGG-OB-305-CNAD52 |
| 7 | Switchcraft-type 05BL5-M compatible with Schaevitz® MP series LVDT readout/controller |

Special Contact Tips

Nine different Schaevitz® contact tips are available for special applications and as replacements for standard tips supplied with most gage heads. All Schaevitz® contact points are 4-48 AGD threaded. To order, select the proper contact tip number.



MS-Type Connector Cables

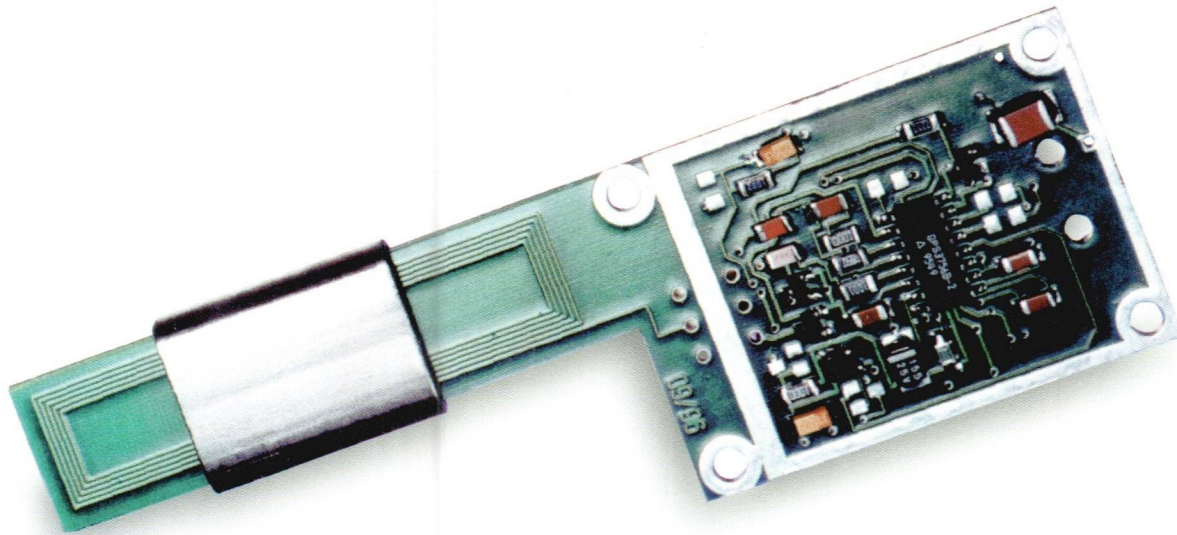
Consult factory for price and availability of adaptor cables for LVDTs and signal conditioners.



Specialized Displacement Sensor Technologies

LVIT-Z

Low Cost/High Volume OEM Linear Displacement Sensor



This unique design incorporates our proprietary LVIT (Linear Variable Inductive Transducer) technology and a signal-conditioned circuitry on a single printed circuit board. With no brushes or wipers to wear, the non-contact, long-life sensor is reconfigured for each OEM, allowing the best possible cost savings. The device is ideal for measuring displacement in the most demanding industrial, automotive and defense applications.

Capable of absolute linear measurements, accuracy is better than $\pm 0.5\%$ over the full stroke of $\pm 0.350"$. The range of the unit can be extended or made to fit OEM application configuration. Its electronics can be configured to operate from single rail (5 VDC) or dual rail (± 15 VDC) supply. With the negative voltage generator designed on board, bipolar output is also available. The scaling can be set to ± 0.5 V less than the input rails.

The LVIT-Z replaces linear potentiometers, LVDTs, Hall effect or magnetoresistive sensors. Its high signal-to-noise ratio allows the sensor to be separated from the electronics by a considerable distance, making the device suitable for space-limited applications.

The high performance, high reliability, cost-effective solutions in a variety of linear position sensing applications.

Features

- ☐ ***Non-contact***
- ☐ ***Voltage or current output***
- ☐ ***PWM output***
- ☐ ***Excellent repeatability***
- ☐ ***Ratiometric or regulated outputs***
- ☐ ***Low cost, high volume replacement for potentiometers***
- ☐ ***Excellent stroke to length ratio***

Applications

- ☐ ***Textile industry dancer arm position sensor***
- ☐ ***Automotive brake pedal position and suspension position measurement***
- ☐ ***Blade-type valve position sensing***

General Specifications

| | |
|----------------------------|---|
| Linear Range | $\pm 0.350''$ (consult factory for other ranges) |
| Input Voltage | +5 VDC or ± 15 VDC, internally regulated; other options available |
| Input Current | 20 mA max (18 mA nominal) |
| Zero O/P | 0 VDC nominal for bipolar unit; 2.5 V for single rail output; other options available |
| Linearity | $\pm 0.5\%$ of full scale max; linearity error decreases with shorter range |
| Output | Monotonic up to ± 3.5 VDC for bipolar unit; other options available up to 90% of the rail voltage |
| Temp Range | -40°C to 85°C |
| T.C of SF | $\pm 0.02\%$ of full scale per $^{\circ}\text{C}$ max |
| T.C. of Zero | $\pm 0.02\%$ of full scale/ $^{\circ}\text{C}$ max |
| Response | 13 Hz, -3 dB down; other options available |
| Connections | 3 or 4 wire, 12" min Red = Input (+5 or +15) White = Output Black = -15 Green = Common |
| Connector | Wires may be replaced with Molex 43045-0406 connector with positive lock |
| Mounting | Screw x 4, #4-40 |
| Size | Consult factory; will be designed and packaged per customer requirements |
| Spoiler | 0.90 in long, SS; other options available per customer requirements |

MagneRule *Plus*™

Magnetostrictive Linear Displacement Transducer



The MagneRule *Plus*™ magnetostrictive linear displacement transducer provides highly accurate absolute position measurement of displacement up to 120 inches (3 meters). The sensor also measures velocity, giving feedback of both position and velocity simultaneously.

Operation is based on accurately measuring the distance from a predetermined point to a magnetic field produced by a movable permanent magnet. The design and durability of the sensor make it ideal for measuring position of moving machine members.

Excellent Performance

A marked improvement over potentiometers for long stroke position measurement, the MagneRule *Plus*™ possesses exceptional linearity, even over lengths up to 120 inches (3 meters), with repeatability up to 0.002% of the measurement range. By utilizing magnetostrictive technology, MagneRule *Plus*, requires no contact between parts that cause friction or premature wear, offering high reliability and extended life. Good stroke-to-length ratio provides for a more compact long stroke position sensor.

Hostile Environments

MagneRule *Plus*™ operates in hostile industrial environments with high temperatures and working pressure. The sensor probe is pressure-sealed with an "O" ring to operate in hydraulic fluids up to 5000 psi. Integral electronics are protected against contamination from dust.

Selectable Inputs/Outputs

MagneRule *Plus* is powered by ± 15 VDC or 24 VDC. By providing an absolute output, no data is lost should power be interrupted. The long stroke sensor offers a universal analog position output, as well as a velocity output. Therefore, one unit can be stocked for multiple applications.

Easy Installation

The design of the MagneRule *Plus*™ permits simple mounting and hookup. Electronics are self-contained in the sensor head, eliminating the need for additional electronic packages. For external sensor installation, special mounting kits and various magnet options are available.

Technology Overview

Custom Designs

For OEM applications with unique requirements, MagneRule Plus™ can be tailored to specific length and mounting requirements. Schaevitz® also offers this sensor with alternate threading, special magnets, and tailored electronics.

Hardware

MagneRule Plus consists of a nonmagnetic, pressure-sealed stainless steel tube (probe) welded to an enclosed stainless steel base (head). The probe contains a stretched magnetostrictive wire, and the head contains the transducer's control electronics. A permanent magnet ring serving as a movable position marker slides over the outside of the tube.

State-of-the-Art Electronics

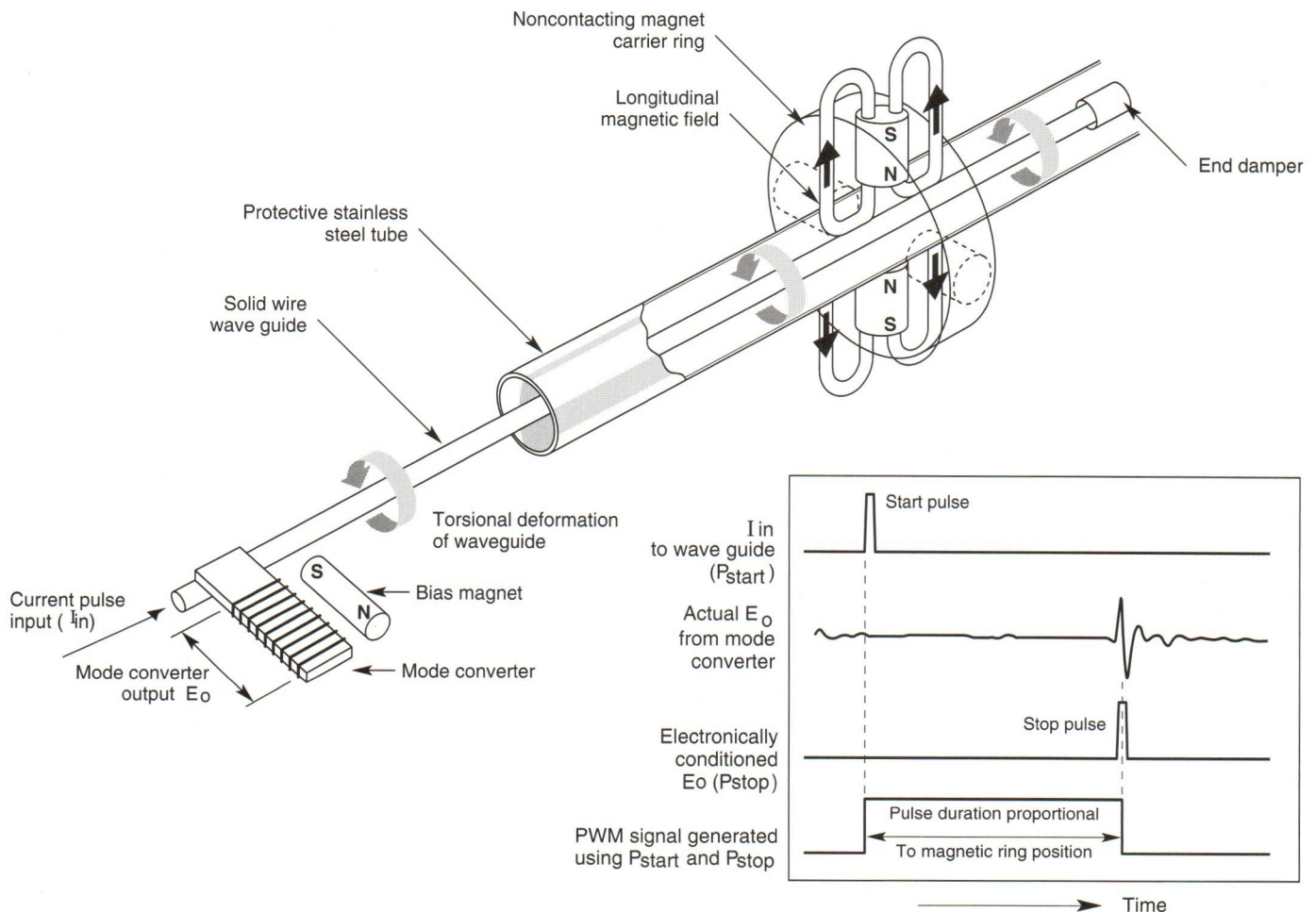
By utilizing the latest in surface mount technology in the design of its electronics, MagneRule Plus™ provides state-of-the-art features such as user-selectable inputs and outputs in a smaller electronics package.

Operation

A trigger coil periodically sends short duration current pulses ("start" pulses) down the waveguide. When the magnetic field accompanying the current pulses intersects the magnetic field of the movable ring, magnetostriction causes a momentary torsional strain in the wire. This strain travels back down the wire and is converted back to an electrical pulse ("stop" pulse) in the head. By measuring the time difference between the start and stop pulses, the position of the magnet ring can be precisely determined.

Universal Analog Outputs

MagneRule Plus™ translates this time-based position measurement into an analog output signal. A user selectable 0 to 10 VDC voltage (either low or high frequency response) or a 4-20 mA current (3-wire) output is available in either forward or reverse slope signals. Additionally, velocity of the moving magnet ring (up to 10 in/sec) is generated by differentiating the position signal.



MagneRule Plus™

Specifications

Performance Specifications

| | |
|------------------------------------|---|
| Standard Ranges | 6, 12, 18, 24, 30, 36, 48, 60, 72, 84, 96, 108 and 120 inches (metric units also available) |
| Input Power | ±15 VDC ±10% (70 mA) or +24 VDC ±10% (90 mA) (inputs are user-selectable) |
| Output | |
| Displacement | 0 to 10 or 10 to 0 VDC at 2 mA max or 4 to 20 or 20 to 4 mA (600 Ohm max loop resistance at 24 V) (outputs are user-selectable) |
| Velocity | 1 V/inch/sec nominal (10 V max) |
| Nonlinearity | 0.05% of full scale output (max) |
| Nonrepeatability | 0.002% of full scale (max) |
| Resolution | Up to 0.002% of full scale |
| Hysteresis | 0.001 inches (max) |
| Frequency Response | |
| Low Noise | -3 dB at 10 Hz, -60° phase shift at 10 Hz |
| Servo | -3 dB at 100 Hz, -15° phase shift at 10 Hz (for other frequencies consult factory) |
| Update Frequency | |
| Range (inches) | (kHz) |
| 6-12 | 6.250 |
| 13-29 | 3.125 |
| 30-63 | 1.583 |
| 64-120 | .781 |
| Operating Temperature Range | |
| Probe | -40° to 85°C |
| Head | 0° to 70°C |
| Storage Temperature | |
| Range | -40° to 100°C |
| Temperature Coefficient .. | 0.007% of full scale per °C |
| Span Adjustment Range .. | 20% of nominal range |
| Zero Adjustment Range ... | 20% of nominal range |
| Ripple | |
| Low noise (6 to 120") | Less than 2 mV rms |
| Servo (6 to 63") | Less than 2 mV rms |
| Servo (64 to 120") | Less than 10 mV rms |

Physical Specifications

| | |
|--------------------------|---|
| Probe | 304SS wetted parts, 5000 psi sealed (340 bar) |
| Cover | Anodized aluminum |
| Cable | 10 feet (3m) PVC jacketed |
| O-rings | Viton® |
| Magnet Ring | Ertalyre* |

Viton® is a registered trademark of DuPont

Outputs

User Selectable Analog Output Signals

MagneRule Plus™ offers a universal analog output signal that is user-selectable. (Sensor gives feedback of both position and velocity simultaneously.)

Users may choose one or all of the following analog outputs when installing the sensor.

Displacement Analog Voltage Output

□ 0 to 10 VDC or 10 to 0 VDC at 10 Hz

□ 0 to 10 VDC or 10 to 0 VDC at 100 Hz

The standard output, used for most commercial data AC aquisition systems, is derived from a 4-pole, 10 Hz low pass filter. Output provides low noise and low ripple. For relatively fast servo system applications, there is a higher response output derived from a 3-pole, 100 Hz filter which has low phase lag at 10 Hz.

Output voltage slope polarity may be reversed by grounding a selected wire. Slope polarity change combined with the standard analog outputs gives 4 different sets of output characteristics: 0 to 10 VDC or 10 to 0 VDC at 10 Hz and 0 to 10 VDC or 10 to 0 VDC at 100 Hz.

Slope polarity change is useful when it is necessary to reverse the operating sense of the measurement, as in "top-down" liquid level applications when the magnet/float at the end of the MagneRule Plus™ is equivalent to minimum level or empty. Other applications include "pull" instead of "push" hydraulic cylinder installations and machine tool motion control systems.

Displacement Analog Current Output

□ 4-20 mA or 20-4 mA at 10 Hz

This 3-wire, 4-20 mA current output is derived from a 4-pole, 10 Hz filter.

It is utilized in industrial and process control applications where there are long cable runs between loop power supply, readout equipment or PLC and the sensor.

Output slope polarity can be reversed by grounding a selected wire, giving two position outputs: 4-20 mA or 20-4 mA at 10 Hz cutoff frequency.

Velocity

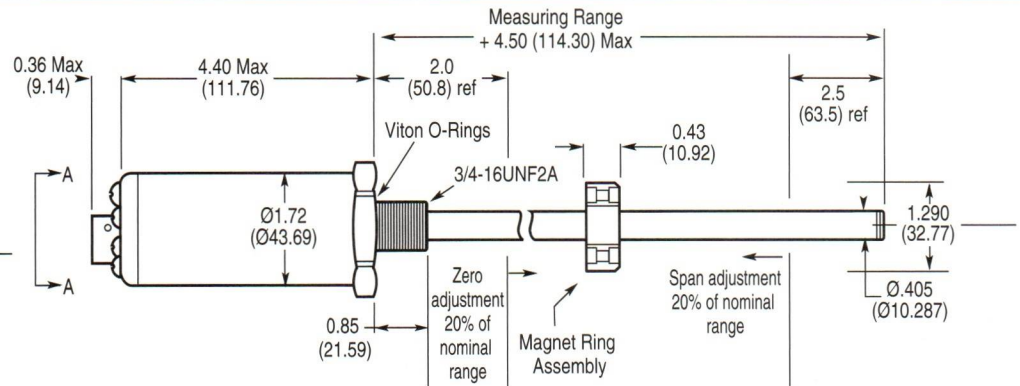
MagneRule Plus™ offers an uncalibrated velocity output derived from the position output. This analog voltage is normally used for rate feedback stabilization in second order servo systems. Because it is the derivative of the position signal, it is only useful over a limited range of velocities, typically from 0.05 inches per second to 10 inches per second. Consult factory for other ranges.

Dimensions in (mm)

Pin Connector Termination

Pin Connections

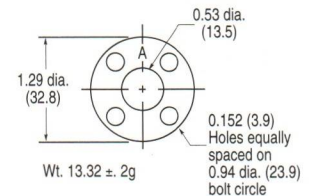
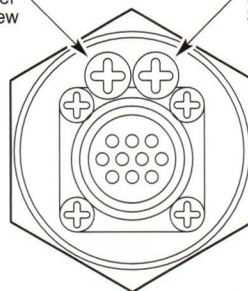
| | |
|----------|--|
| A | +15 V IN/+24 V IN |
| B | Common Ground |
| C | Analog Ground |
| D | -15 V IN |
| E | V Out, 100 Hz |
| F | V Out, 10 Hz |
| G | Velocity |
| H | Current |
| J | Reverse (Connect to red or cap off with no connection for standard slope polarity) (Connect to black for reverse slope polarity) |
| K | No connection |



Zero Trim Potentiometer Sealing Screw

View A-A

Span Trim Potentiometer Sealing Screw

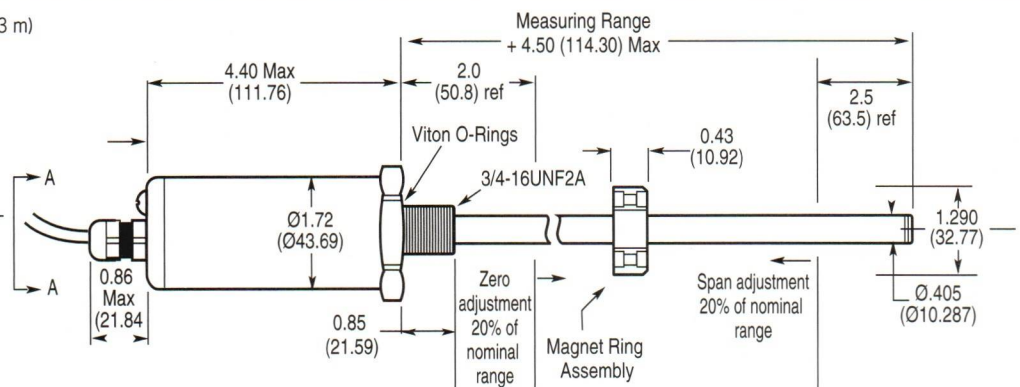


Ring Magnet Assembly

Cable Termination

10 ft (3 m)

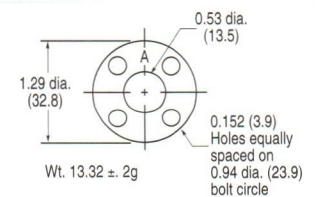
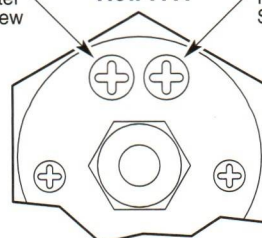
| Cable Color | Function |
|--------------------|--|
| Brown | V Out, 100 Hz |
| Blue | Analog Ground |
| Black | Common Ground |
| Violet | Current |
| Green | V Out, 10 Hz |
| Orange | Reverse (Connect to red or cap off with no connection for standard slope polarity) (Connect to black for reverse slope polarity) |
| White | -15 V IN |
| Red | +15 V IN/+24 V IN |
| Yellow | Velocity |



Zero Trim Potentiometer Sealing Screw

View A-A

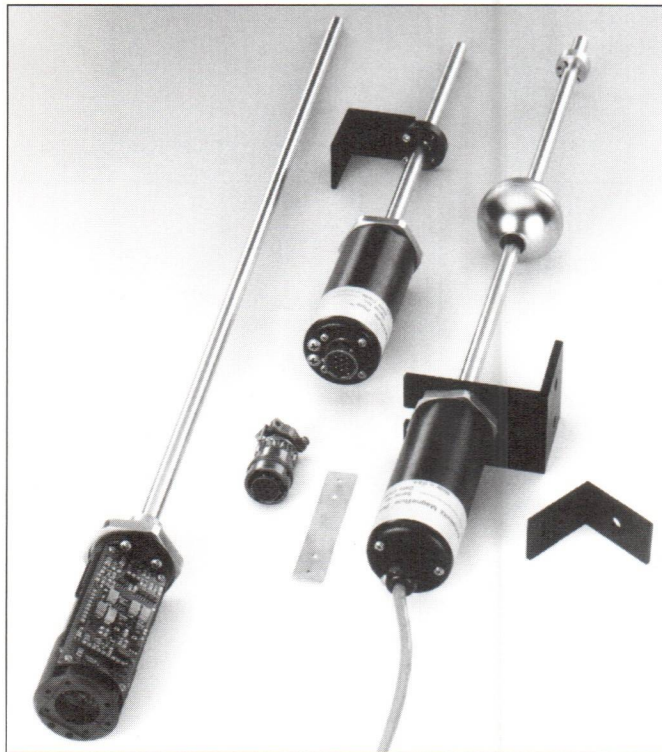
Span Trim Potentiometer Sealing Screw



Ring Magnet Assembly

MagneRule Plus™

Accessory Mounting Kit and Float Assembly



Mounting Kit

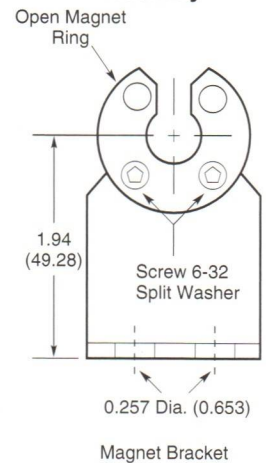
For simplified external sensor installation, mounting kits are available that include appropriate mounting and support brackets, and an open magnet assembly.

To order specify kit:

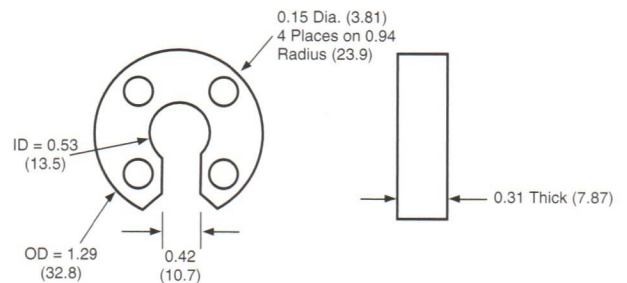
MK-1 (For lengths of <4 feet)

MK-2 (For lengths >4 feet)

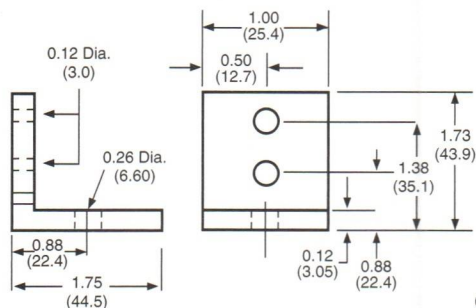
Magnet Ring/Bracket Assembly



Open Magnet Ring



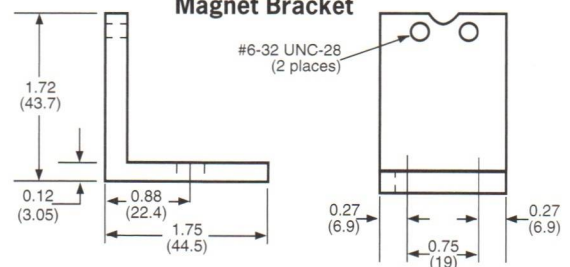
Tube Bracket



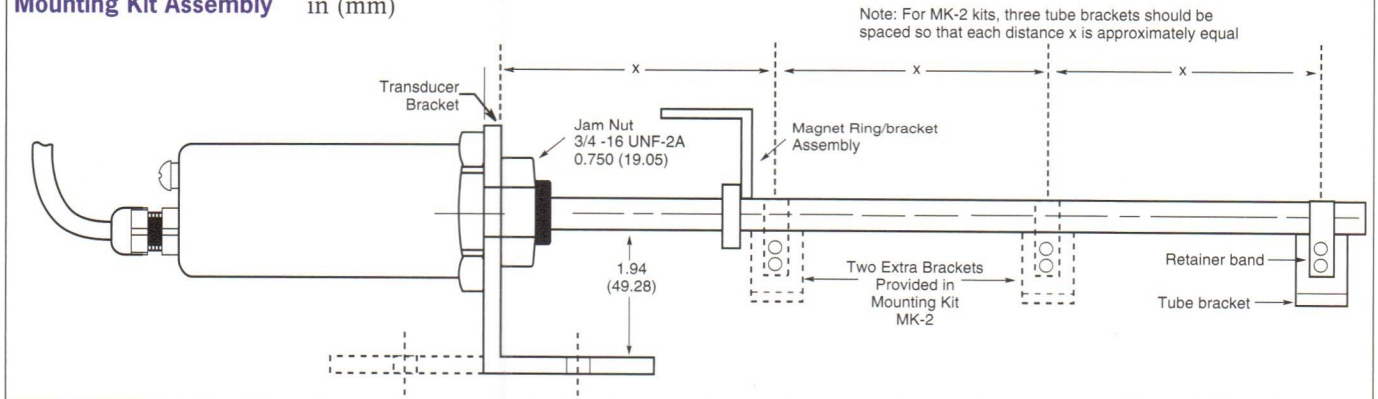
Retainer Band



Magnet Bracket



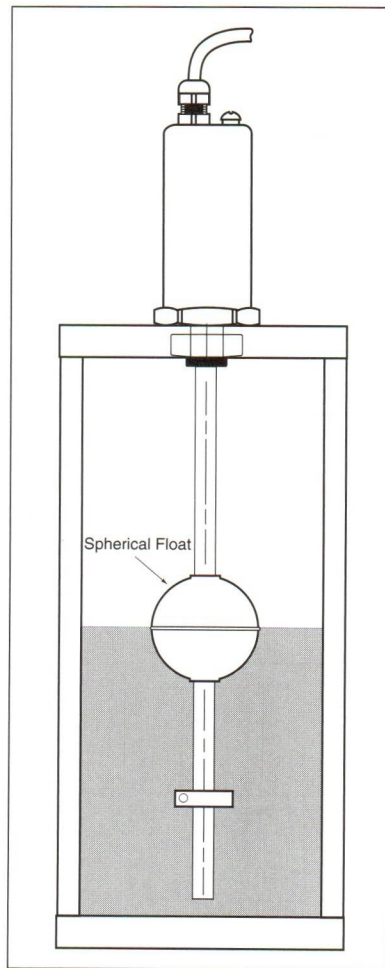
Mounting Kit Assembly in (mm)



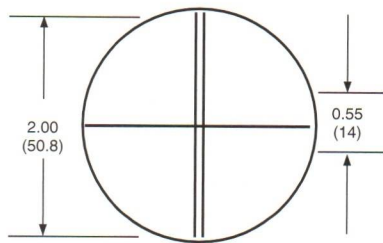
Float Kit

MagneRule Plus™ can monitor the actual fluid level in a container with the addition of a float kit. The MagneRule's stainless steel rod is positioned directly into the fluid. A spherical float containing an integrated permanent magnet measures the fluid level. The float kit includes a spherical float, retaining collar, and transducer bracket. The entire assembly is mounted vertically.

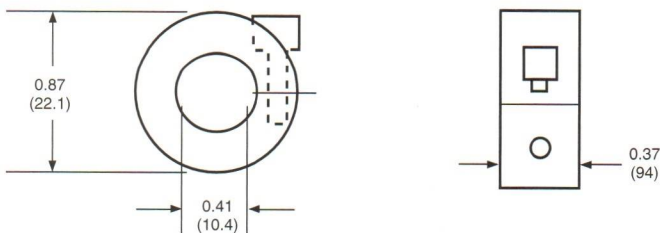
To order specify: FK-1



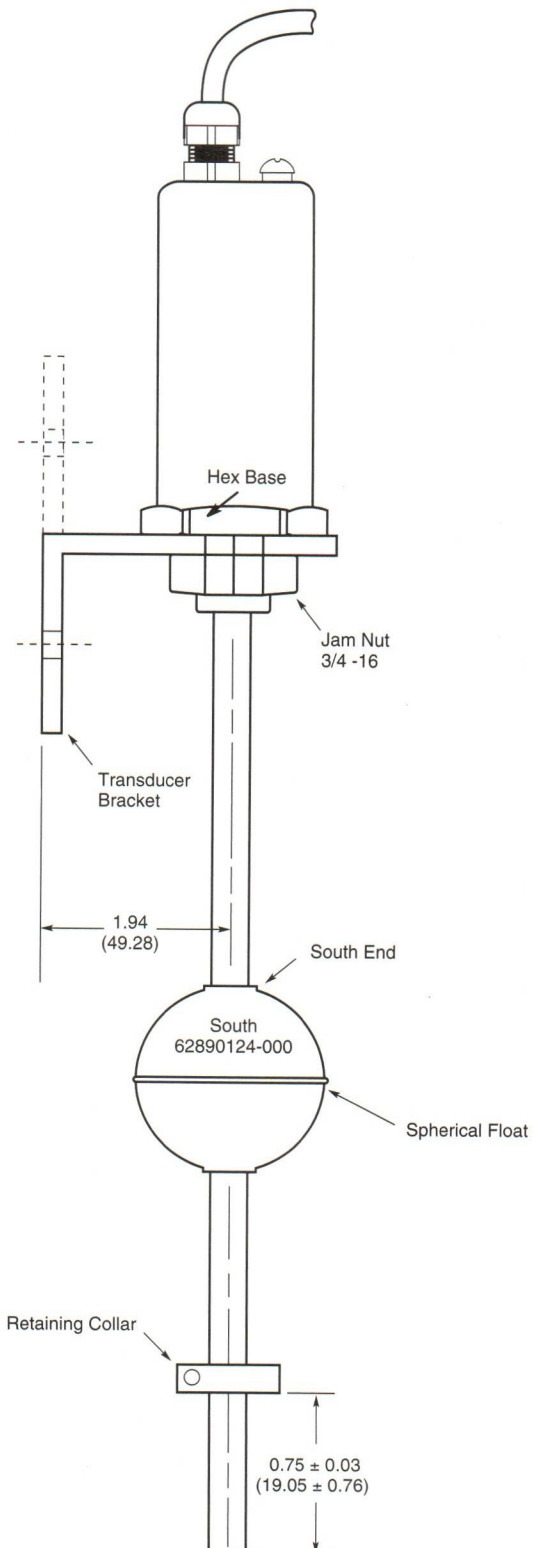
Spherical Float



Retaining Collar



Float Kit Assembly in (mm)



MagneRule Plus™

Ordering Information

How to Order

A standard ring magnet assembly, nonmagnetic mounting screws and hole-location templates are shipped with each MagneRule Plus™. When ordering please complete model number by specifying unit output and measurement range.

Ordering Example:

Model Number MRU-3000-012 is a MagneRule Plus™ with a standard (V/in) calibration, standard output, standard cable termination, standard base, and a standard 12 inch range.

MRU - 3 0 0 0 - 012⁽¹⁾

Calibration

3 V/in (standard)

4⁽¹⁾ V/cm (optional)

Output

0 User-selectable analog outputs (standard)

Termination

0 Cable Termination (standard)

2 Connector termination (optional)

Base

0 Imperial mounting hole dimensions (standard)

1 Metric mounting hole dimensions (optional)

Unit Range⁽¹⁾

Specify range from 6 inches (006) or 15 cm (015) to 120 inches (120) or 305 cm (305)

| Code | Inches | Code | Centimeters |
|------|-----------------------|------|-------------------|
| 006 | 6 inches (standard) | 015 | 015 cm (standard) |
| 012 | 12 inches (standard) | 031 | 030 cm (standard) |
| 018 | 18 inches (standard) | 045 | 045 cm (standard) |
| 024 | 24 inches (standard) | 061 | 061 cm (standard) |
| 030 | 30 inches (standard) | 076 | 076 cm (standard) |
| 036 | 36 inches (standard) | 091 | 091 cm (standard) |
| 048 | 48 inches (optional) | 122 | 122 cm (optional) |
| 060 | 60 inches (optional) | 152 | 152 cm (optional) |
| 072 | 72 inches (optional) | 183 | 183 cm (optional) |
| 084 | 84 inches (optional) | 213 | 213 cm (optional) |
| 096 | 96 inches (optional) | 244 | 244 cm (optional) |
| 108 | 108 inches (optional) | 274 | 274 cm (optional) |
| 120 | 120 inches (optional) | 305 | 305 cm (optional) |

⁽¹⁾ For metric calibration (V/cm), unit range is specified in centimeters.

For use with all
Schaevitz® AC LVDTs
and Gage Heads



LVDT Instrumentation

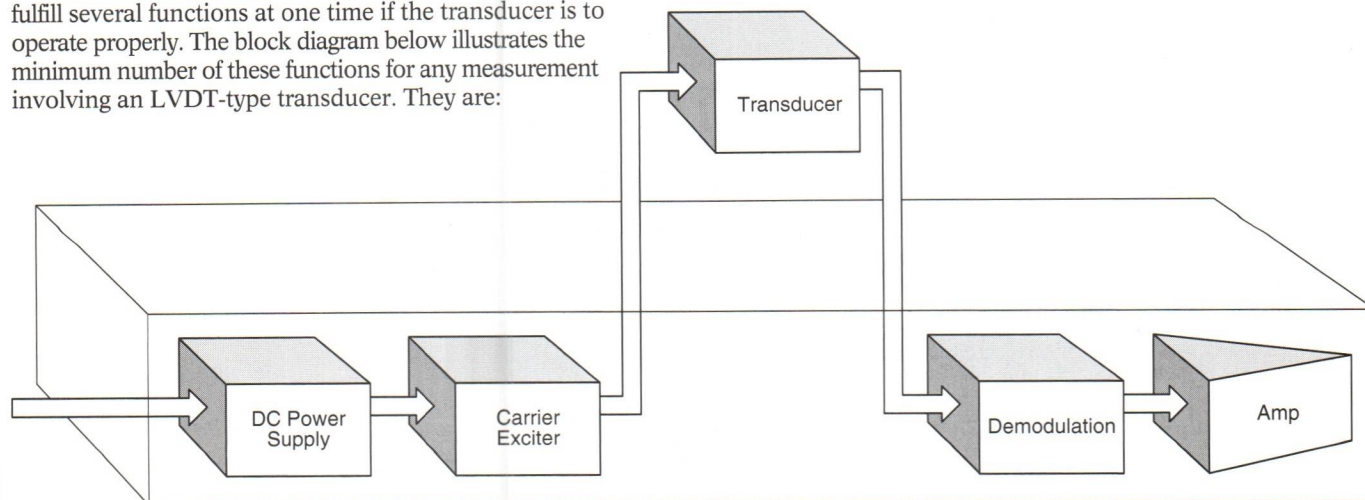
Schaevitz® LVDT Instrumentation

A Choice of Technology



As the premier manufacturer of LVDTs and LVDT-type transducers, Schaevitz® is uniquely qualified to offer transducer instrumentation for use with LVDTs and LVDT-based gage heads. The use of Schaevitz® instrumentation avoids the problems that can be encountered in a transducer-based measurement application when transducers are supplied by one manufacturer, instrumentation by another and interfacing them must be done by the user. By utilizing both Schaevitz® transducers and instrumentation, the transducer measurement system is assured of compatibility and proper functioning for the application.

The instrumentation used with an LVDT-type transducer must fulfill several functions at one time if the transducer is to operate properly. The block diagram below illustrates the minimum number of these functions for any measurement involving an LVDT-type transducer. They are:



Excitation

An AC LVDT requires constant-amplitude AC input, at a frequency not readily available. This means that an oscillator of the appropriate frequency must be connected to an amplifier with amplitude regulation on its output.

Amplification

An LVDT's output is usually too low-level to operate ordinary readouts, so it is necessary to amplify the output of the LVDT. Sometimes this is done in two steps, using an AC carrier-amplifier prior to demodulation and a DC amplifier after demodulation.

Demodulation

Most readouts are DC-operated devices, so the amplified AC output must be converted into filtered DC before it can be used with ordinary DC-type readout devices. Furthermore, taking advantage of the phase polarity of an LVDT for direction sensing requires the use of a synchronous demodulator.

Demodulators are usually followed by one or more stages of low-pass filtering.

DC Power

All of the electronic circuits require stable DC voltage for proper operation.

In addition to these specific functions of transducer instrumentation, it is sometimes necessary to include other functions. Among these are:

Signal Modification

Typical signal modifications include current output instead of voltage output and analog-to-digital conversion.

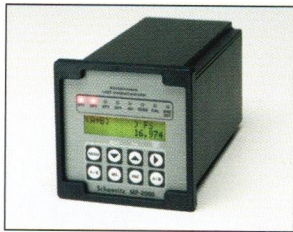
Integral Readout

Readouts or display devices can be incorporated within the enclosure of transducer instrumentation. To indicate transducer values remotely, digital output signals can be developed with an RS-232 or serial interface.

Control

Schaevitz® microprocessor-based readout/controllers also provide the ability for set-point control in conjunction with relays, TTL logic, or other on-off controls.

Microprocessor-Based LVDT Readout/Controller

MP1000 and MP2000**Pages 100-101**

The upgraded MP1000 series single and MP2000 dual input gaging controllers offer complete math functions, and user-defined set points for process feedback.

- Simultaneous dual channel
- CE approval (pending)

Single Channel LVDT Panel Meter

PML1000**Pages 102-103**

The PML1000 is an AC line powered LVDT/RVDT panel meter that is ideal for industrial and test applications.

- 5 digit LED display
- 125 Hz unscaled analog output, isolated 0-10 VDC/ 4-20 mA scaleable output and RS422/485 communications

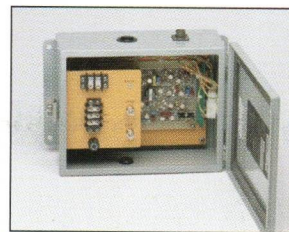
Analog Transducer Amplifier

ATA-2001**Pages 104-107**

The new ATA 2001 gaging amplifier offers true analog response and resolution, with the ease of digital calibration.

- CE certified
- Voltage and current outputs

LVDT/RVDT Position Transmitter

IEM/421**Pages 108-109**

The IEM/421 is specifically designed for industrial and process control applications utilizing LVDTs.

- Excellent linearity
- NEMA 13 enclosure

PC-Based Dimensional Data Acquisition System

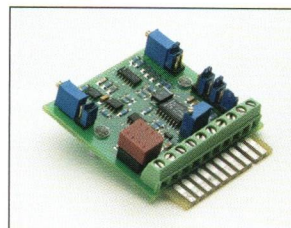
SLS-8/SYS-96**Pages 110-113**

The SLS-8 and SYS-96 data acquisition systems close the quality control loop on manufacturing processes.

- Microprocessor-based system offers signal conditioning, data gathering and computation
- Interfaces with most inductive transducers



LVDT Voltage Module

LVM-110**Page 114**

The LVM-110 LVDT signal conditioning module consists of a carrier oscillator, AC amplifier, demodulator, filter and DC amplifier.

- ± 15 VDC operated
- Plug-in, stacked or card guide installation

**SCHAEVITZ
SENSORS**

MP1000 and MP2000 Series

Single and Dual Channel LVDT Readout/Controller

The Schaevitz® microprocessor-based LVDT indicator and set-point controller is designed for industrial and process control applications utilizing any LVDT/RVDT-based measurement device. In addition to displaying real-time readings of LVDTs and gage heads, these single and dual-channel instruments display MIN, MAX and TIR values. A dual channel model is also capable of A+B and A-B functions.

A 16-bit analog-to-digital converter provides high speed performance and resolution. An RS-232 output will communicate data to any standard PLC or computer serial port.

MP Series readout/controllers are packaged in a 1/4 DIN case with a back-lit, super-twist LCD display. (Units are splash-proof when mounted with a gasket.)



New Features

- ☐ *Simultaneous dual channel display*
- ☐ *Opto-isolated setpoint outputs*
- ☐ *Digitally scaled analog output*
- ☐ *Digitally controlled analog zero suppression*
- ☐ *CE approval pending*
- ☐ *Programmable digital filtering*

Applications

- ☐ *LVDT-based weighing systems*
- ☐ *RS-232 data collection for SPC*
- ☐ *Roller gap control*
- ☐ *Concentricity gages*
- ☐ *Tank level control*
- ☐ *Part classification*

MP Series Accessories

- ☐ *Relay option board*
- ☐ *Lab stand/bench mount*
- ☐ *Rack adaptor holds up to four MP Series Readout/Controllers (see page 121)*

Setpoint Control

Four user-programmable digital setpoints are used to monitor any parameter. Any combination of high or low setpoints may be selected. A high and low hysteresis value from 0 to 200 display counts can be programmed for the setpoints. Decimal points are programmable via the set-up menu.

Auto-Calibration

A front panel pushbutton auto-zeros (tares) over the \pm full scale range. Auto-calibration eliminates calculation of slope or gain factors. Calibration and setup parameters are stored in nonvolatile memory for retention on power down or interruption.

Readings

A two-line alphanumeric display provides user-friendly word prompts for easy pushbutton system setup and monitoring of in-process measurement parameters.

- Current value
- Min/max
- A+B (sum of two channels)
- A-B (difference of two channels)
- TIR (Total Indicated Runout)

Outputs

A real-time scaled analog output, proportional to the digital readout is provided for each LVDT channel. An RS-232 output is provided for data transfer to a computer at 600 to 19.2K baud.

General Specifications

LVDT Excitation

| | |
|-----------------|---|
| Voltage | 1 and 3 V rms ($\pm 10\%$) (switch selectable) |
| Current | Up to 30 mA rms per LVDT |
| Frequency | 2.5, 3.3, 5 and 10 kHz ($\pm 5\%$) (switch selectable) |

Input Sensitivity 0.6 or 1.2 V rms for full scale readout (switch selectable)

Input Impedance 100k ohms

Linearity $< \pm 0.02\%$ of full scale

Digital Display 5 digit (± 99.999) 5 mm (0.2") super-twist LCD with LED backlight

Analog-to-Digital Converter 16-bit charge balance

Conversion Rate 180 conversions per second per channel (max)

Digital Output Serial RS-232, full duplex 600 to 19.2K Baud (switch selectable)

Setpoints 4 user-programmable, high or low

Hysteresis User-settable from 0 to 200 display counts

Outputs Opto-isolated open collector logic outputs, 5 VDC, 50mA per setpoint (Relay outputs optional)

Response Typically within 20 mS

Operating Temperature 0° to 55°C

Power Requirements 100 to 250 VAC, 50-60 Hz

How To Order

Order by model number.

| Model Number | # Channels |
|--------------|--------------|
| MP1000 | Single input |
| MP2000 | Dual input |

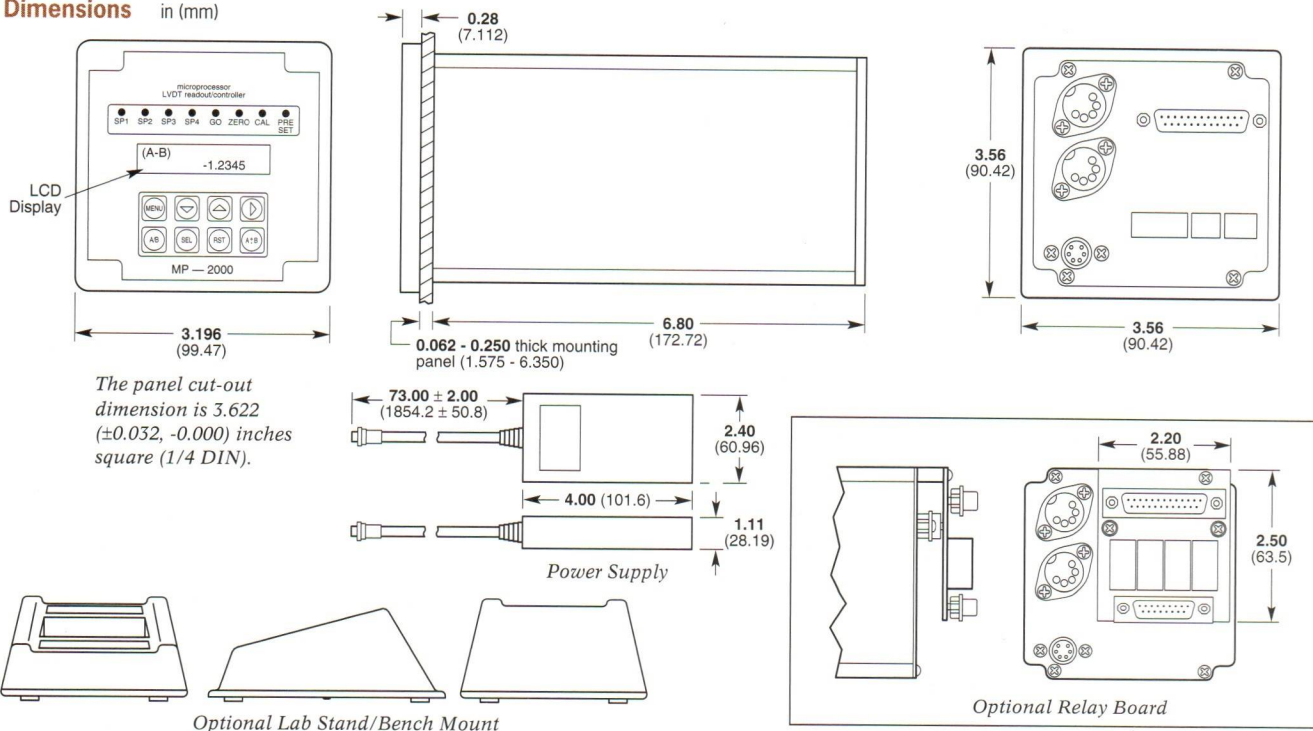
Input/Output Connections

| Pin | Description | Pin | Description |
|-----|-------------|-----|------------------|
| 1 | Setpoint #4 | 16 | Setpoint #2 |
| 2 | DSR In | 17 | Setpoint #1 |
| 3 | TxD Out | 18 | SP Return |
| 4 | DTR Output | 19 | Remote Reset |
| 5 | RxD | 20 | Output Channel B |
| 6 | Reboot | 21 | Output Channel A |
| 7 | Sync Input | 22 | Case Shield |
| 8 | Sync Output | 23 | Vcc (5VDC) |
| 14 | Remote Zero | 24 | Digital Ground |
| 15 | Setpoint #3 | 25 | Analog Ground |

Each 2 channel unit provided with:

2 transducer connectors (J1 and J2)
Power supply and cord
25-pin subminiature D mating connector
Comprehensive operation/programming manual

Dimensions in (mm)



PML1000

Single Channel LVDT Panel Meter

The PML1000 is an AC line powered LVDT/RVDT panel meter that is ideal for industrial and test applications. It features a 5 digit variable brightness LED display. For control applications, it has a fast (125 Hz) unscaled analog output, an isolated 0-10 VDC/4-20 mA scaleable output and optional serial 2 or 4 wire RS 422/485 communications. The PML1000 is compatible with all standard Schaevitz® LVDTs and RVDTs with a user-selectable 1 or 3 V 2.5 or 10 kHz supply.

Two logic control inputs are provided to allow remote control of user pre-programmed functions (zero, hold, display max/min/average, etc.). The unit also has two user pre-programmed function keys (zero, hold, display max/min/average, etc.). The PML1000 meets European safety and EMC requirements for panel mounted equipment.

Features

- ☐ 5 digit display
- ☐ 90 to 265 VAC operation
- ☐ Auto-calibration
- ☐ 2 programmable logic inputs
- ☐ 2 programmable function keys
- ☐ Max, Min, Average, Zero and Hold functions
- ☐ Voltage and current outputs
- ☐ Compatible with all Schaevitz® standard LVDTs and RVDTs
- ☐ Low voltage operation

Options

- ☐ RS422/485 serial communications
- ☐ Low voltage operation
- ☐ Rack adaptor (see page 121)

Applications

- ☐ Test stands
- ☐ Process monitoring
- ☐ Feedback control

How To Order

Order by model number.

| Model Number | Description |
|--------------|--------------------------------------|
| PML1000-000 | Standard unit |
| PML1000-040 | With RS422/485 serial communications |
| PML1000-140 | Low voltage and communications |



Status (Logic) Inputs

One or more of the following functions can be user assigned to either of the two logic inputs: Tare, Auto (Offset) Zero, Display Hold, Analog Output Hold, Display Max, Display Min, Display Average, Display Test, Reset Max/Min & Average (to the current measured value), Enter Button Lock (disables entry to configuration menus), "Fast-Cal" Calibration Enable.

The logic inputs can be switched by external volt free contacts or a TTL signal

Function Keys

One or more of the following functions can be user assigned to either of the two front panel function buttons: Tare, Zero, Display Hold, Display Max, Display Min, Display Average, Display Test, Reset Max/Min & Average (to the current measured value), "Fast-Cal" Calibration Enable

High Speed Analog Output

This is a buffered output giving a fast response from the LVDT demodulator output. The signal amplitude is dependent on the transducer excitation and the amount of sensor travel. Output filter: -3 dB @ 125 Hz

"Fast-Cal" Calibration

Automatically calibrates and matches the indicator to a connected LVDT transducer. The PML1000 reads the transducer's output at any two sensor positions. The two measured values are stored as the calibration parameters. Calibration can be performed at any time.



Specifications

Display 5 digit with user-selectable decimal point position

LVDT Input

Input Voltage Range 0.05V to 5 Vrms
Nonlinearity $\leq \pm 0.05\%$
Temperature Drift $\leq \pm 0.05\%$ FSO/ $^{\circ}\text{C}$
Stability $\leq \pm 0.01\%$ FSO after 15 minutes
Transducer Supply Selectable 1 or 3 V rms @ 25mA
Supply Frequency Selectable 2.5 or 10 kHz
Measurement Resolution Better than 1 part in 120,000
Measurement Rate 10 readings per second
Measurement Mode User-selectable 4 wire differential or 5 wire ratiometric

Isolated Analog Output

Isolation 500 VDC/Peak AC
Output User-selectable 0-10 V, 0-20 mA or 4-20 mA
Scaling User-selectable
Accuracy Better than 0.2%
Temperature Drift ≤ 500 ppm/ $^{\circ}\text{C}$
Response 63% within 132 mS; 99% with 200 mS
Resolution 0.05% (5 mV or 0.01 mA)
Max Voltage Output 11 V @ 22 mA
Max Current Output 22 mA @ 18 V
Max Load 900 Ω
Output Damping Filter Programmable

Serial Communications

Type RS422/485, 2 or 4 wire multidrop
Isolation 500 VDC/Peak AC
Speed 1200, 2400, 4800, 9600 baud
Parity Odd, even or none
Stop Bits 1 or 2
Protocols User-selectable for MODBUS™ (RTU or ACSII), J-BUS

Math

Max/Min Stores maximum and minimum display values
Averaging Calculates average value over a user-defined period between 1 and 9999 seconds

Power Requirements Standard: Universal 90 to 265 VAC 50 ~ 60 Hz @ 12 VA nominal;
 Low Voltage: 24 VAC or VDC $\pm 20\%$, 50 ~ 60 Hz @ 12 VA nominal

Environmental

Temperature 10 $^{\circ}$ to 50 $^{\circ}\text{C}$ (operating);
 -10 $^{\circ}$ to 70 $^{\circ}\text{C}$ (storage)
Humidity 0-95% RH non-condensing

Physical

Panel Mount 1/8th DIN panel mount
Dimensions H x W x D 1.89" (48 mm) x
 3.78" (96 mm) x 6.81" (173 mm)
Panel Cut-Out H x W 1.73" (44 mm) x
 3.62" (92 mm)
Depth Behind Panel 6.65" (166 mm) including terminals
Weight 14.1 oz (0.4 kg);
 19.4 oz (0.55 kg) shipping

Safety and EMC

Safety EN61010
Susceptibility EN50082-1 & 2
Emissions To EN50081-1 & 2; EN50022 Class A for radiated and conducted

ATA-2001 LVDT Amplifier

True Analog Conditioner with Digital Calibration

The new Schaevitz® analog transducer amplifier is a general purpose, AC line-powered LVDT/RVDT conditioner featuring state-of-the-art design principles. The new SMT (Surface Mount Technology) design uses an embedded microprocessor to generate a PWM-shaped sine wave and control all calibration functions. The processor is also employed in the demodulation, filtration and synchronization of the LVDT signal. All settings are stored in non-volatile memory for restoration on power up. Zero, Span and Phase adjustments are accomplished via the use of splashproof front panel pushbuttons and digital voltage dividers, eliminating the need for drift-inducing screw adjust potentiometers. All amplifier controls are accessible from the outside of the rugged aluminum enclosure.

The new ATA 2001 is CE certified, and is intended for the most rigorous, industrial applications. The ATA 2001 has been tested to the highest industrial standards for EMI, RFI and ESD.

The ATA 2001 is designed for universal compatibility with all 4, 5, and 6 lead LVDTs. A wide range of oscillator frequencies combined with two excitation voltages, 3.5 and 0.5 Vrms, provide maximum versatility. The high power carrier amplifier has more than twice the drive capability of previous designs. Able to power low impedance LVDTs at higher amplitudes, the ATA 2001 provides measurement resolutions beyond any product currently available.

The ATA 2001 is contained within a rugged, extruded aluminum housing. The one-piece design provides optimal amplifier performance under the most rigorous EMI and RFI conditions. An integral panel mounting system provides for convenient 1/8 DIN standard, panel installation. Pre-punched 19" rack adapters are available from Schaevitz® to accommodate up to eight amplifiers per adapter installation.

Features

- ❑ **2.5, 5.0 and 10.0 kHz switch selectable excitation**
- ❑ **Digital filtering**
- ❑ **CE certified**
- ❑ **Switch selectable 115 or 220 VAC operation**
- ❑ **Voltage and current outputs**
- ❑ **Microprocessor controlled calibration and synchronization**
- ❑ **1/8 DIN standard panel mounting**
- ❑ **Splashproof front panel with status LEDs**

Options

- ❑ **Rack adaptor holds up to 8 ATAs (see page 121)**

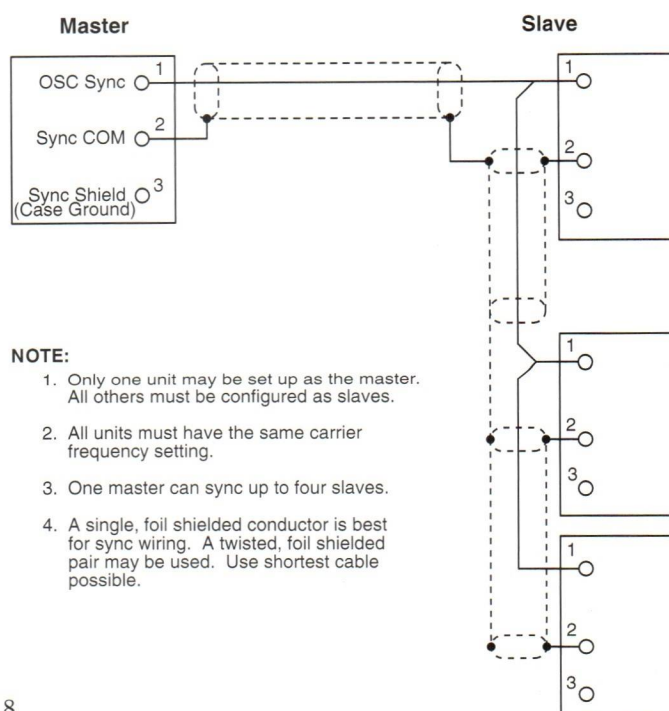


Applications

- ❑ **Control valve position feedback**
- ❑ **Head box slice lip position control**
- ❑ **Precision metrology labs**
- ❑ **Roller gap position feedback**

Auto Fall-Back Synchronization

An auto fall-back synchronization feature allows reliable master/slave operation, for prevention of amplifier cross talk, without the worry of sync signal loss. If the internal processor in a slave amplifier detects an unstable or missing sync signal, the internal clock will take over, continuing at the preselected nominal frequency. Upon restoration of a normal sync pulse, the oscillator will return to the slave mode.



Common Specifications

Electrical:

Power Requirements 115 VAC $\pm 10\%$, 50-400 Hz;
220 VAC $\pm 10\%$, 50-400 Hz
(switch selectable)

Line Voltage Regulation .. $\pm 10\%$, no change in output

Transducer Excitation

Voltage 3.5 V rms nominal (switch
selectable for 0.5 V rms)

Frequency 2.5, 5.0 and 10.0 kHz (switch
selectable)

Current 45 mA rms (max)

Analog Output:

Voltage Output

Bipolar ± 10 VDC max (10 mA max)

Unipolar 0-10 VDC max (10 mA max)
(with 100% zero suppression)

Output Impedance $< 1\Omega$

Noise and Ripple < 3 mV rms at 2.5 kHz
excitation

Current Output 4-20 mA

Maximum Loop

Resistance 700 Ω (with internal loop
supply); 1000 Ω (with 24
VDC external loop supply)

Noise and Ripple 10 μ A rms (max)

Frequency Response (nom): -3 db at
250 Hz for 2.5 kHz excitation
500 Hz for 5.0 kHz excitation
1000 Hz for 10 kHz excitation

Amplifier Characteristics:

Sensitivity Range

High Gain 0.040 to 0.9 VAC rms in = 10
VDC output

Low Gain 0.500 to 10.0 VAC rms in =
10 VDC output

Note: -5 VDC output = 4.0
mA current output; +5 VDC
output = 20 mA current
output; 0 VDC output = 12
mA current output

Input Impedance 100k Ω

Zero Suppression $\pm 110\%$ full scale output

Phase Shift

Compensation $\pm 120^\circ$ maximum

Non-linearity and

Hysteresis $\leq \pm 0.05\%$ of full scale output

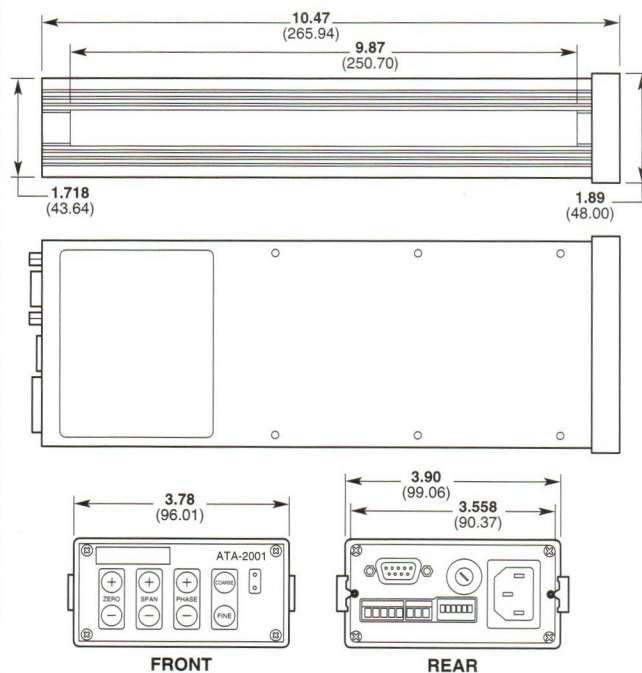
Stability Better than $\pm 0.05\%$ of full
scale output (after 20 minutes)

Tempco $\leq \pm 0.02\%$ of full scale output/
 $^\circ$ F (0.04%/ $^\circ$ C)

Operating Temp. Range -40° to 185° F (-40° to 85° C)

Weight 2.1 lbs (950 g)

Dimensions in (mm)



How To Order

Order by model number.

Model Number

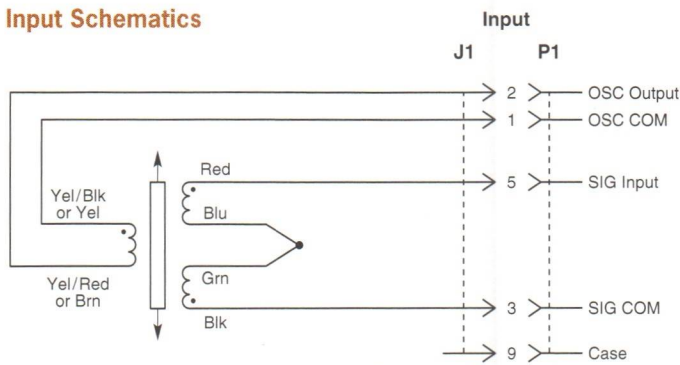
ATA-2001

See page 121 for optional rack adaptor (holds eight ATAs).

ATA-2001 LVDT Amplifier

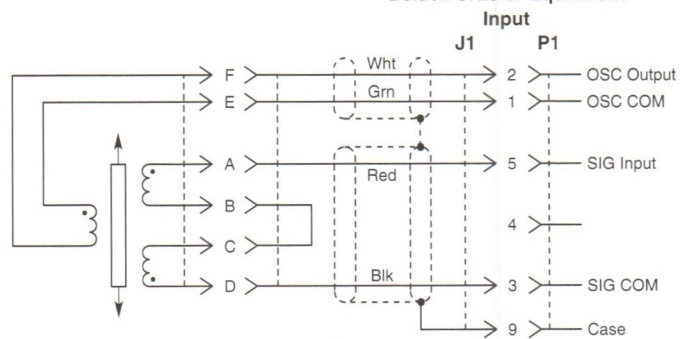
True Analog Conditioner with Digital Calibration

Input Schematics

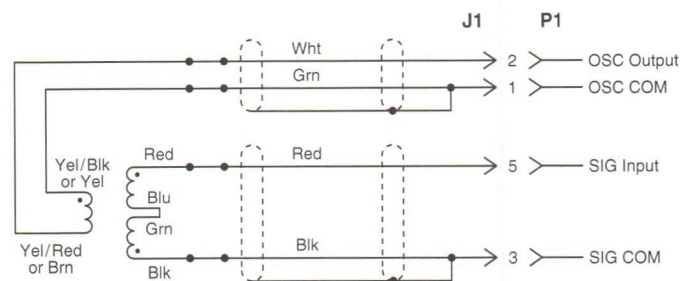


LVDT with Leads or Cable

Belden 8723 or Equivalent



LVDT with Connector



LVDT with Leads and Spliced Cable

| Connect to Input J1 | Pin 1 | Pin 2 | Pin 3 | Pin 5 | Pin 9 |
|---|---------------------|---------------------|-------|-------|--------|
| LBB315PA-200 PCA-499 | Blue | Red | White | Green | Shield |
| All other LBBs and color coded LVDTs | Yel / Blk or Yel | Yel / Red or Brn | Black | Red | Shield |
| Letter coded | E | F | D | A | |

NOTE: Center tap must be tied at LVDT in all cases.

P1

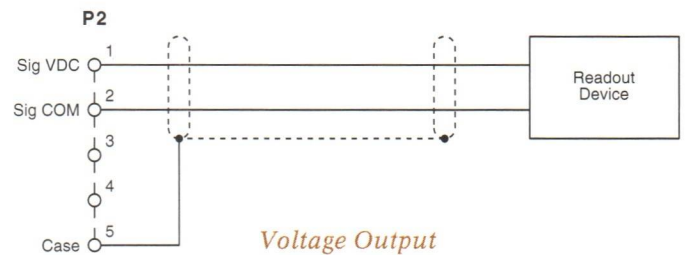


Input Connector

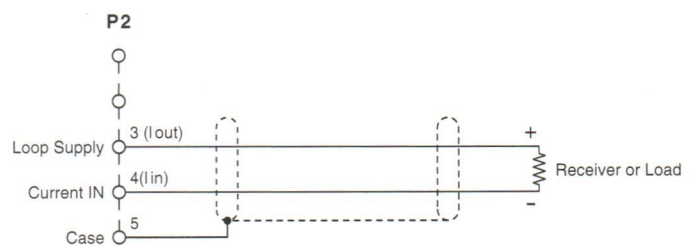
Rear view (wiring side)
of mating connector

Input Connections-LVDT with Connector

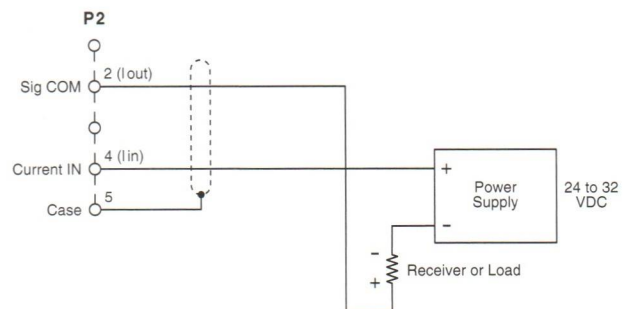
Output Schematics



Voltage Output



*4-20 mA Current Output
Using the Internal Loop Supply*

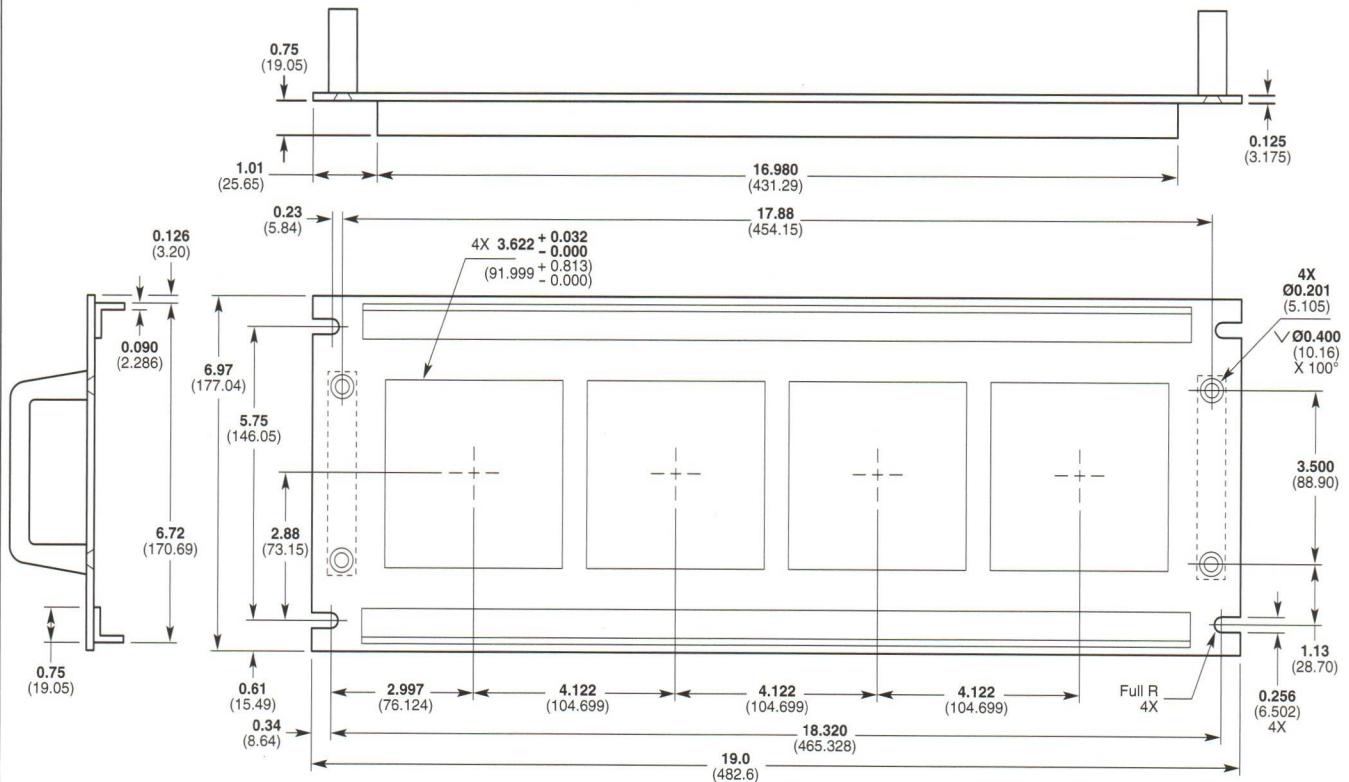


*4-20 mA Current Output
Using the External Loop Supply*

Rack Adaptor Option

Accommodates up to eight ATA amplifiers (page 104), eight PML 1000s (page 102), or four MP Series Readout/Controllers (page 100).

in (mm)



How To Order

Order by model number.

Model Number

RACK ADAPTOR

IEM/421

LVDT Transmitter

The IEM/421 is a power line operated current transmitter expressly designed for industrial and process control applications utilizing LVDTs and RVDTs. Its output is 4-20 mA current into a loop resistance up to 500 Ohms. It also features 100% zero suppression, which permits the entire displacement range of an LVDT-type transducer to be used.

The IEM/421 is packaged in a heavy duty NEMA 13 enclosure to protect from dust, dirt, water and other contaminants usually encountered in an industrial or process control environment. Power and output connections are made through a conduit port in the enclosure, while the LVDT connections are made through an environmentally-sealed bayonet-type connector.

Features

- ☐ *Excellent linearity*
- ☐ *100% zero suppression*
- ☐ *Wide range demodulator phase adjustment*
- ☐ *NEMA 13 enclosure*
- ☐ *4-20 mA current output*

Applications

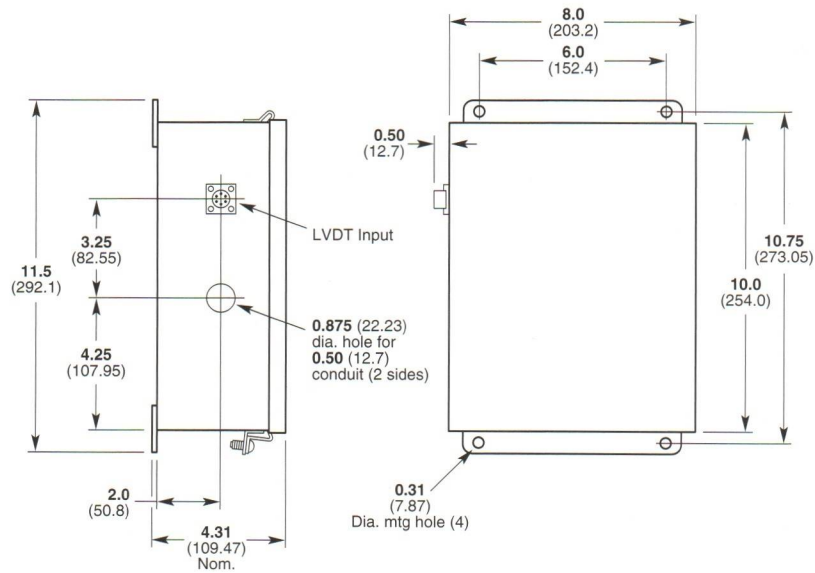
- ☐ *Steam turbine throttle valve position feedback*
- ☐ *Pulp paper industry*
- ☐ *Power plant control systems*
- ☐ *Roller gap process control*



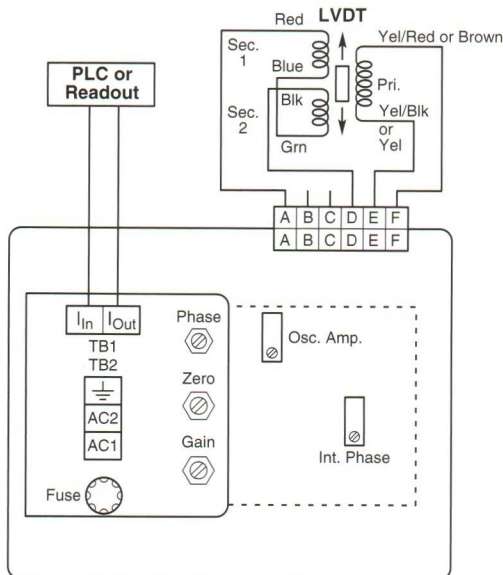
Specifications

| | |
|---|---|
| Power Requirements | 115 VAC rms $\pm 10\%$, 50-400 hz; 220 VAC rms $\pm 10\%$ 50-400 Hz (optional) |
| Line Voltage Regulation | $\pm 10\%$ line voltage change produces less than $\pm 0.1\%$ of full span change in output current |
| Transducer Excitation | 3.5 V rms (nominal); internally adjustable from 2-5 V rms, 25 mA (maximum) |
| Excitation Frequency | 2.5 kHz nominal |
| Input Impedance | 100 Kohms |
| Sensitivity | 300 mV rms input change produces full span output- current change |
| Full Span Output | 4-20 mA |
| Loop Resistance | 0-500 ohms |
| Nonlinearity and Hysteresis | Less than $\pm 0.05\%$ of full span output |
| Frequency Response | (-3 dB) 250 Hz nominal |
| Output Stability | Better than $\pm 0.05\%$ of full span output after 30 minutes warm-up |
| Thermal Coefficient of Sensitivity | Less than $\pm 0.02\%$ of full span output per $^{\circ}\text{F}$ ($\pm 0.035\%$ FSO/ $^{\circ}\text{C}$) |
| Zero Adjustment Range | $\pm 100\%$ of full span output |
| Phase Shift Range | $\pm 60^{\circ}$ (internal adjustment provides additional $\pm 60^{\circ}$) |
| Operating Temperature Range | 30 $^{\circ}\text{F}$ to 130 $^{\circ}\text{F}$ (0 $^{\circ}\text{C}$ to 55 $^{\circ}\text{C}$) |
| Weight | 11.75 lbs (5.3 kg) |

Dimensions in (mm)

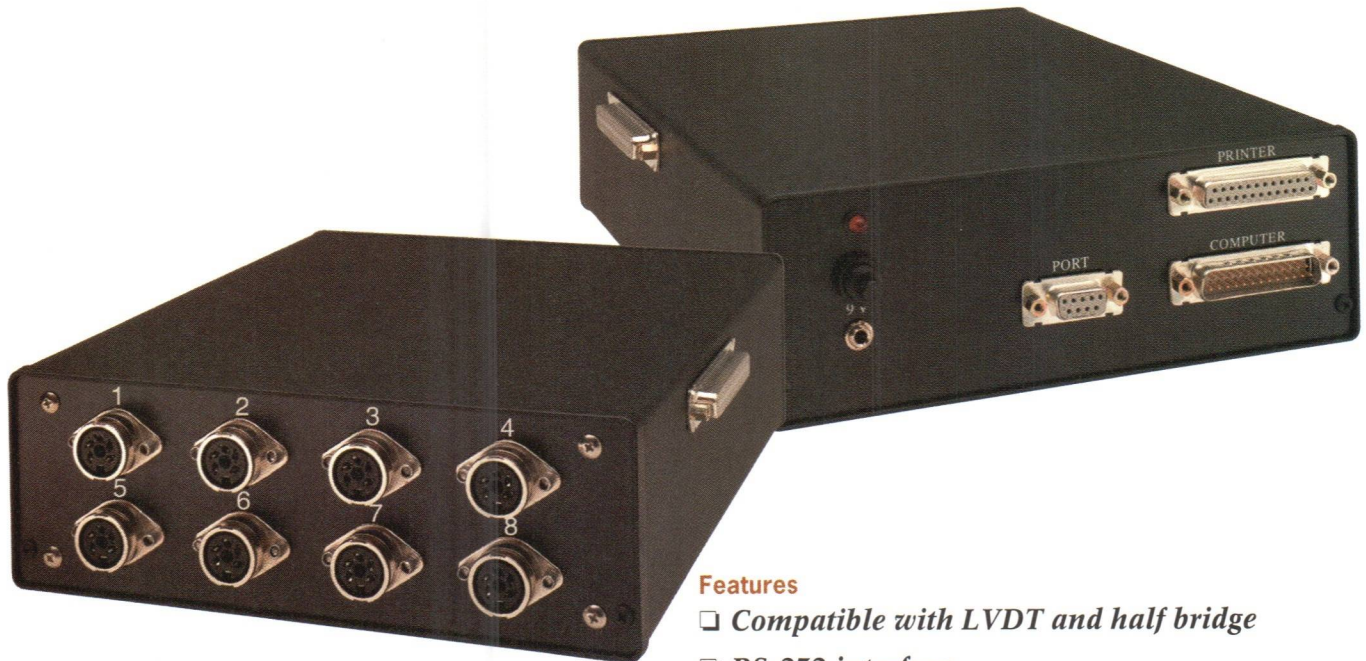


Wiring



SLS-8

PC-Based Dimensional Data Acquisition System



Schaevitz® Sensors introduces the new SLS-8 LVDT interface system. Each SLS-8 self-contained system is a single board computer with eight channels of LVDT conditioning and a PC interface. The standard SLS-8 LVDT interface system comes with an RS-232 serial and a parallel communications port with a pass through printer port. A Universal Serial Bus interface is under development.

The internal microprocessor performs multiple math and trig functions, to relieve the host system of most of the post collection data processing burden.

Wall-mount power supplies are available in 115 or 240 Volts ac. The 115 Volt U.S. version is UL and CSA approved. The 240-Volt version has CE approval for European distribution. Adapters will be required for the various countries in Europe, as Mains plugs are not standardized.

The software supplied comes complete with drivers for Windows® 95, 98, ME, NT and 2000.

The SLS-8 software utility has provisions for the calibration and complete control of all the function calls available on the SLS-8 LVDT interface system.

The SLS-8 software package also supports Dynamic Data Exchange. This feature allows measurement information to be cut and pasted from the operating software, into other DDE and OLE supporting programs, such as Microsoft® Excel. This real-time link will allow information to be ported directly into your current statistical analysis software or data processing package.

Features

- ☐ *Compatible with LVDT and half bridge*
- ☐ *RS-232 interface*
- ☐ *Parallel pass through interface*
- ☐ *USB interface available soon*
- ☐ *Wall-mount power supply*
- ☐ *Self-contained operating system*
- ☐ *14-bit resolution*
- ☐ *Programmable scan rates up to 1000 samples/sec*
- ☐ *Internal MIN, MAX and TIR functions*
- ☐ *Combine units for up to 32 inputs*
- ☐ *Compatible with Windows™ 95, 98, ME, NT and 2000*

Applications

- ☐ *Gas and steam turbine blade gages*
- ☐ *SPC for complex machine parts*
- ☐ *Architectural truss stress testing*
- ☐ *Adhesive dead weight creep testing*
- ☐ *Bridge deflection testing*
- ☐ *Automotive glass*
- ☐ *CRT masks and funnels*
- ☐ *Structural monitoring of buildings and dams near fault lines*
- ☐ *Profilometers for telescope mirrors and satellite dishes*

Special OEM Configurations

- ☐ *SYS-96 Cable Adapter Plate*
- ☐ *2.5, 5.0 or 10.0 kHz Transducer Excitation*
- ☐ *Special Digital or DC Analog Inputs*

General Specifications

| | |
|---|--|
| Electrical Input | Wall-mount power supplies (9-Volt dc. @ 1.0 Amp) |
| Supply Voltage | 120 VAC 60 Hz (UL & CSA approved); 240 VAC 50 Hz (CE approved for Europe) |
| | NOTE: All approvals refer to power supply only. |
| Communications | (Internal jumper selectable) Parallel port with printer pass-through serial RS-232 port (USB available soon) |
| Sensor Excitation: | |
| Voltage | VAC 1.15 RMS (3.25 P-P) |
| Amplitude Temperature Coefficient | 0.005%/°C |
| Frequency Temperature Coefficient | 0.1%/°C |
| Oscillator Frequency | 5.0 kHz (2.5 and 10.0 upon request) |
| Drive Current (max) | 8.0 mA RMS |
| LVDT Input Impedance (min) | 150 Ω |
| Accuracy: | |
| Linearity (typical) | ±0.05% of full scale |
| Resolution | 14-Bit |
| Environmental: | |
| Operating Temperature | -40° to 85°C |
| Survival Temperature | -55° to 125°C |

SYS-96

PC-Based Dimensional Data Acquisition System

Schaevitz® SYS-96 data acquisition system closes the quality control loop on manufacturing processes by collecting, processing, and displaying manufacturing information for real-time data management and post-process statistical analysis with SPC programs.

Comprised of an expansion card and operating software, the SYS-96 fits into any PC compatible, full-length ISA slot. The system performs real-time dimensional data acquisition at greater cost efficiency than traditional data collection methods. Capable of supporting most inductive transducers, including Schaevitz® dimensional gage heads and LVDTs, SYS-96 collects data from in-process gaging fixtures, calculates and graphically displays data according to predefined formulas.

An on-board microprocessor running at 16 MHz performs multiple real-time mathematical calculations (such as $A+B$, $A-B$, peak, valley, trig functions and averaging) before transferring readings to the host computer. System software provides easy access to these processing functions as well as data viewing options. In addition to real-time graphics, the SYS-96 provides limit status, bar graphing of results and multiple screen viewing.

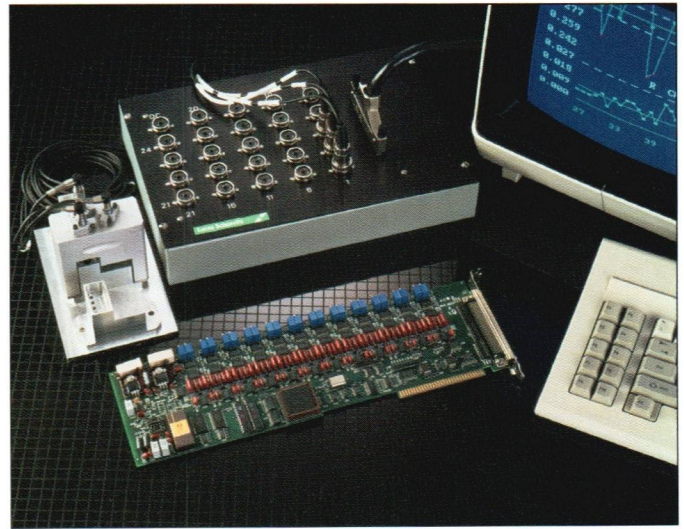
SYS-96 may be custom configured in 8 transducer increments for up to 96 inputs in one computer. Four auxiliary ± 5 VDC analog inputs are provided with each standard system board for temperature measurement, switch and other control signalling.

Features

- ☐ **Microprocessor-based system offers signal conditioning, data gathering and computation capabilities**
- ☐ **Raw data processed to user-defined formulas**
- ☐ **Data files stored in standard delimited ASCII format**
- ☐ **Interfaces with most inductive transducers**
- ☐ **Expandable to 96 inputs**
- ☐ **Math capabilities**
- ☐ **On-line data collection**
- ☐ **SPC compatible data**
- ☐ **High-speed, on-board processor**

Applications

- ☐ **Automated data analysis**
- ☐ **Factory-wide quality management**
- ☐ **Data traceability/security**
- ☐ **Automated inspection**



Automated Data Analysis

Manual data collection from sensors can often be error-prone and laborious as information is tabulated prior to entry into a database. The Schaevitz® data acquisition system automatically gathers and processes data from multiple sources according to user-defined formulas. Data collection from transducers is fast and efficient with the SYS-96 ability to scan up to 3,500 channels (formula cells) per second.

Factory-wide Quality Management

With access to real-time, in-process data, machine operators can analyze manufacturing problems and take corrective action, saving valuable costs in scrap and rework. The data acquisition system automates inspections by grouping information in lots, not just single parts.

Data Traceability/Security

With documentation in a readable format, both management and customers can verify product quality. SYS-96 increases control of data by storing readings on disk in an ASCII (Lotus® format) file, eliminating the need for manual entry and protecting data for future analysis. A system user ID option protects data from intervention.

Compatible with SPC Programs

Software outputs data in a file format compatible with standard statistical software. Schaevitz® supplies interface routines for custom applications in various programming languages.

Expandable to Meet Your Needs

SYS-96 can be configured with 8, 16 or 24 transducer inputs per board. The system can condition up to 96 inductive transducers through a 24-input, 4-board configuration. Four auxiliary ± 5 VDC inputs are included with each system board (regardless of configuration) for temperature measurement, switch status, and other control signalling.

Hardware

SYS-96 operates as a subsystem inside the host computer, communicating directly with the P.C. bus. System components include:

- 8-bit full slot main board(s) with on-board processor
- 6-foot interface cable assembly
- Transducer junction box
- Operating system diskette and manual

A 4-board, 96-input system requires four full-length adjacent ISA slots.

Transducer Compatibility

The system interfaces with virtually all inductive transducers including:

- LVDT
- RVDT
- LVRT
- Half bridge
- Inductive proximity
- Gaging, long stroke and other LVDT-based transducers

The external transducer junction box with cable serves as the bridge between these transducers and the host computer. Ports are individually configured for various transducer sensitivities.

Software

Easy-to-use, pull-down menu software provides both viewing and programming capabilities to system operations. Help indices and syntax checking support easy and accurate system set-up and data manipulation.

Capabilities

- A+B/A-B
- Algebraic/trig functions
- TIR operations
- System status
- Multiple viewport
- Graphing
- Security features
- Auto-calibration (eliminates standardization requirements)
- Auto-zero (Auto-mastering)
- User-definable limit set points/indicators

General Specifications

| | |
|---|--|
| Power Requirements | +5 VDC, 0.50A, +12 VDC, 0.50A (24-channel board) |
| Resolution | 14-bit |
| Scan Rate | 3,500 channels per second (scans defined channels only) |
| Memory Requirements | 640K |
| Oscillator Section | 24 independent oscillators |
| Transducer Excitation | 2.3 or 1.15 V rms (nominal); 5 kHz regulated amplitude; other frequencies optional/all channels slaved |
| Typical Temperature Coef. Excitation | Amplitude: 0.005%/°C; Frequency: 0.1%/°C |
| Minium Transducer | |
| Primary Impedance | 150 ohms (nominal) |
| Demodulator Section | 24 independent demodulators |
| Input Impedance | 10K ohms |
| Typical Linearity Error | Less than 0.05% full scale |
| Adjacent Channel | |
| Isolation | 90 dB |
| Oscillator Rejection | >72 dB below output level at full scale |
| Gain Adjustments | Each channel individually adjustable 20:1 |

How to Order

Each SYS-96 is custom configured to meet particular requirements. To specify a SYS-96, please determine:

- LVDT make, model, and stroke over which they will be used in your application.
- Number of transducer inputs (8, 16, 24 – up to 96 of any combination).
- Overall system accuracy and resolution requirements

LVDT Voltage Module

LVM-110 Series

DC Powered
Voltage Module

The LVM-110 Module is a DC-powered LVDT signal conditioner board consisting of a carrier oscillator, AC amplifier, demodulator, filter, and DC amplifier. Excitation can be either 2.5 kHz, 5 kHz, or 10 kHz, selectable by plug-in jumpers. 100% zero suppression is also provided by dip jumper selection, providing a unipolar 0 to 10 VDC output over the full range of the LVDT.

Six plug-in jumper selectable gain ranges are available to provide a ± 10 VDC analog output, with LVDT full scale outputs from 100 mV rms to 5.6 V rms. An on-board span pot is provided at no extra cost for precise control within each gain stage. Jumper selectable master/slave function allows synchronization of multiple LVM-110 cards to prevent beat frequencies and cross talk between transducers.

The board mounted 20-turn zero pot provides a ± 2 volt ($\pm 20\%$) range. Two plug-in jumpers provide a ± 4 volt fixed step, thus allowing a total range of ± 6 volts for $>100\%$ zero suppression of 0 to 10 VDC at - full scale to + full scale of the LVDT.

The LVM-110 is designed for either plug-in installation or 10 point screw terminal barrier strip. It can be mounted or stacked by permanently attached threaded stand-offs or by PC card edge guides.

Modules operate with five and six-wire LVDTs for greater compatibility. Extended PC card edges are provided for card edge mounting. Special designs and configurations are available upon request for OEM applications.

The LVM-110 is not compatible with models XS-B 099 and 249; MHR 005; and XS-ZTR 100, 250, 500 and 1000.

Specifications

Transducer excitation

| | |
|-----------------|--|
| Voltage | 3.5 $\pm 10\%$ Vrms (up to 15 mA) |
| Frequency | 2.5 kHz, 5 kHz, or 10 kHz (may be synchronized for multi-channel operation) |

Output

| | |
|--------------------|---------------------------------|
| Voltage | ± 10 VDC max |
| Current | 5 mA max |
| Impedance | < 1 ohm |
| Sensitivity | 0.10-5.6 V rms for FS output |
| Fixed Ranges | 6 selected by plug-in jumpers |
| Zero | ± 6 V total |
| Adjustable | 2.5 -1 (screwdriver adjustable) |

Nonlinearity

Frequency Response (-3dB) 250 Hz (nominal)

Temperature Coefficient

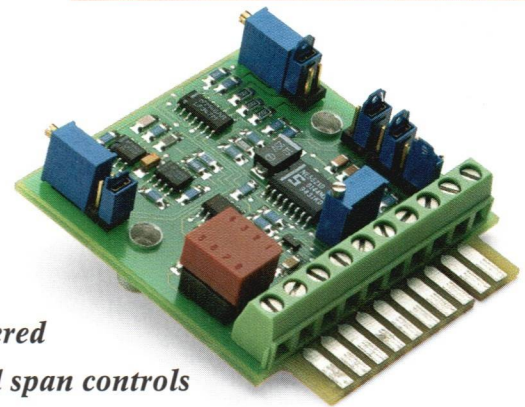
Operating Temperature

Range

Gain Controls

Input power Requirements...

Stability



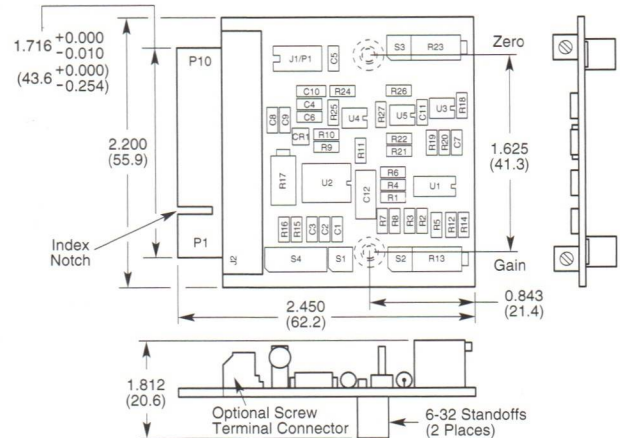
Features

- ☐ DC powered
- ☐ Zero and span controls
- ☐ Six jumper selectable gains
- ☐ Plug-in, card edge, or stand-off installation
- ☐ 2.5 kHz, 5 kHz or 10 kHz excitation
- ☐ Linkable oscillators

Applications

- ☐ Low cost analog front end for dimensional gaging
- ☐ LVDT signal conditioning for OEM applications

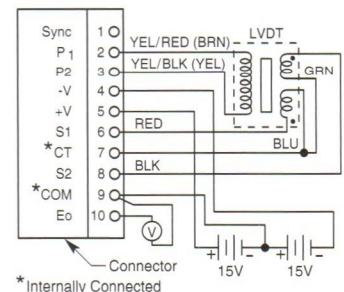
Dimensions in (mm)



Wiring

Mating Connector

TRW/Cinch 50-10A-20 (optional)



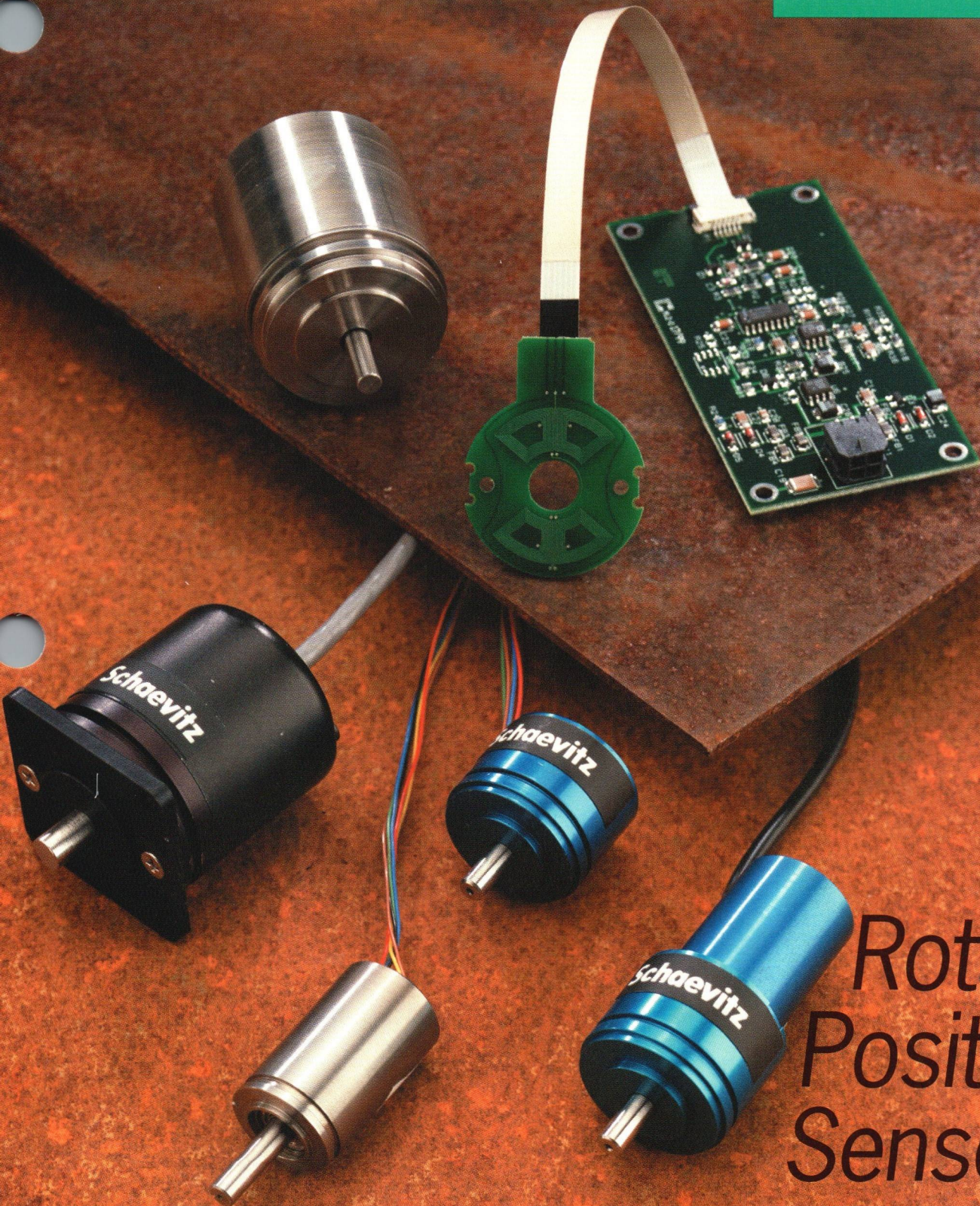
How To Order

Order by model number.

Model Number

LVM-110

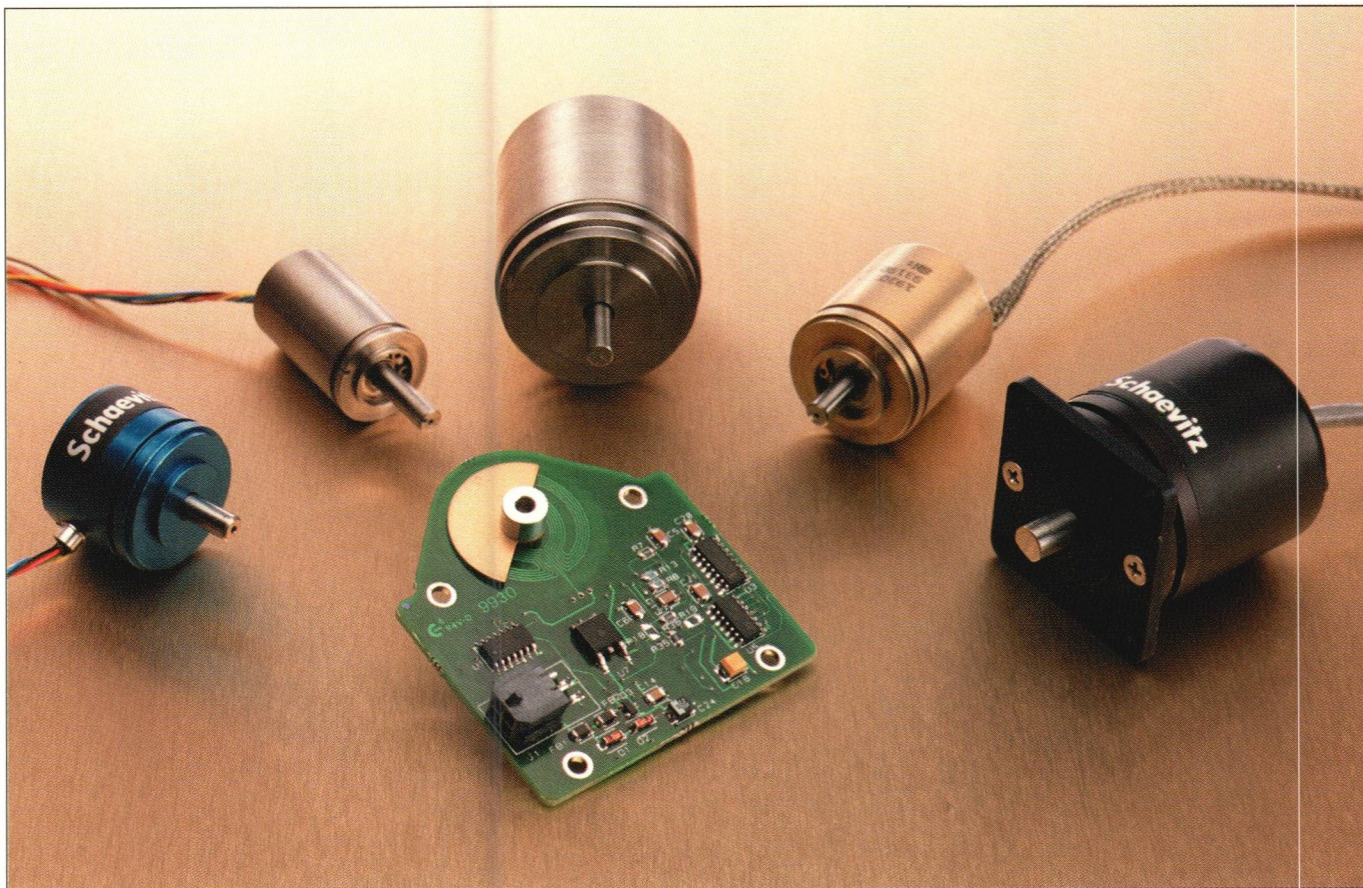
Rotary Position Sensors



Rotary
Position
Sensors

Rotary Position Sensors

A Choice of Technology



Rotary position transducers incorporate a range of features and technologies designed to meet diverse rotary position measurement requirements. Our complete line of rotary transducers satisfies both general and specialized applications, offering high reliability for absolute rotary position measurements. Standard features include a noncontact design, virtually infinite rotational life, a fully signal conditioned output, infinite resolution, and 360 degree rotation. We also offer a variety of options which users can select to achieve an excellent solution to virtually any rotary measurement problem.

Units requiring special form or function can be developed to meet specific program requirements. Our application engineers are ready to answer your calls and discuss cost and design solutions for your specific requirements. Standard rotary position transducers for many applications are available from stock for next day shipment.

Features

- ☐ *Infinite resolution*
- ☐ *High degree of linearity*
- ☐ *Fully signal conditioned*
- ☐ *Virtually infinite life*
- ☐ *Noncontact design*
- ☐ *Low noise*
- ☐ *Wide operating temperature range*
- ☐ *Custom range capability*

Applications

- ☐ *Ball valve position feedback*
- ☐ *Control surface position*
- ☐ *Rotary actuator feedback*
- ☐ *Bell crank position feedback*
- ☐ *Dancer arm position*
- ☐ *Hydraulic pump control*

Rotary Variable Differential Transformers (RVDTs)

RVDTs are available in both AC operated (R30A, R36AS) and DC operated (R30D) versions. AC operation offers the user exceptional performance in high temperature environments, while DC operation provides integrated signal conditioning for convenient interfacing to measurement equipment.

R30A



Pages 132-133

The R30A operates over a $\pm 30^\circ$ range, and offers nonlinearity of less than $\pm 25\%$ of full scale.

- AC-Operated
- $\pm 30^\circ$ range
- Size 11 servo mount

R36AS



Pages 132-133

The R36AS operates over a $\pm 30^\circ$ range, and offers nonlinearity of less than $\pm 25\%$ of full scale.

- AC-Operated
- Stainless steel package
- $\pm 30^\circ$ range
- Size 15 servo mount

The R36AS Rotary Positioner can be used with the CTS 420 Transmitter (see page 116 for R36AS specifications and page 68 for CTS 420 transmitter specifications)



R30D



Pages 134-135

The R30D RVDT is a DC operated noncontacting rotary transducer that provides integrated signal conditioning.

- $\pm 30^\circ$ range
- Size 11 servo mount

RSYN for Hostile Environments

RSYN-8-30 & RSYN-11-30



Pages 142-143

The RSYN non-contacting transducers survive shock and vibration, humidity and salt mist and extreme temperatures.

- DC-Operated
- $\pm 30^\circ$ range

Rotary Variable Inductance Transducers (RVITs)

RVITs are DC operated noncontacting rotary transducers. The proprietary design provides superior performance and low cost. The predominantly digital circuitry is very resistant to environmental disturbances and is ideally compatible for use with most digital electronics. RVITs offer wide operating temperature range, infinite resolution, and a virtually infinite rotational life.

R60D



Pages 136-137

The R60D offers nonlinearity of less than $\pm 0.25\%$ without sacrificing other performance parameters.

- $\pm 60^\circ$ range
- Size 11 servo mount

RVIT-15-60/RVIT-15-120I

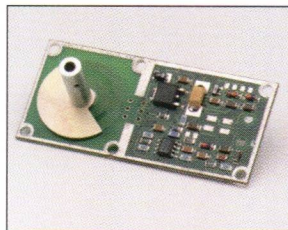


Pages 138-139

RVIT-15-60 and RVIT-15-120I rotary transducers are available in outputs of ± 3 VDC or 4-20 mA respectively.

- $\pm 60^\circ$ or 0 to 120° range
- Size 15 servo mount (flange mount available)

RVIT-Z



Pages 140-141

The RVIT-Z provides an ultra low profile, high accuracy solution for rotary and angular measurements in OEM applications.

- 0 to 120° ($\pm 60^\circ$) range
- No wipers, brushes, slip rings or magnetic materials

Accessories

R-Flex™ Coupling



Pages 128

The R-Flex coupling can be used with all Shaevitz rotary position sensors.

- Easy installation
- Corrects for most types of rotary sensor shaft misalignment

SCHAEVITZ
SENSORS

R30A/R36AS RVDTs

AC-Operated Rotary Variable Differential Transformers

RVDTs incorporate a proprietary noncontact design that dramatically improves long term reliability when compared to other traditional rotary devices such as syncros, resolvers and potentiometers. This unique design eliminates assemblies that degrade over time, such as slip rings, rotor windings, contact brushes and wipers, without sacrificing accuracy.

High reliability and performance are achieved through the use of a specially shaped rotor and wound coil that together simulates the linear displacement of a Linear Variable Differential Transformer (LVDT). Rotational movement of the rotor shaft results in a linear output signal that shifts ± 60 (120 total) degrees around a factory preset null position. The phase of this output signal indicates the direction of displacement from the null point. Noncontact electromagnetic coupling of the rotor provides infinite resolution, thus enabling absolute measurements to a fraction of a degree.

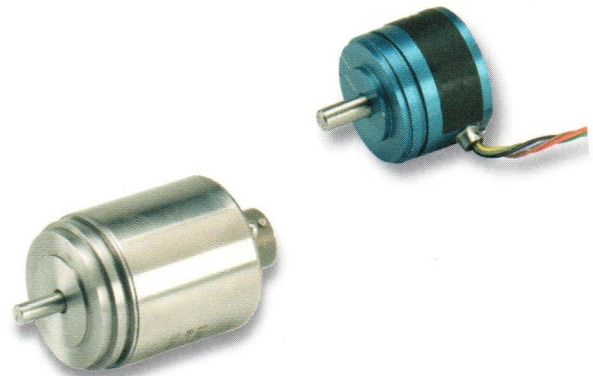
R30A/R36AS

The R30A and R36AS RVDTs are AC operated rotary transducers. AC excitation of 3 V rms results in a ratiometric AC output voltage that varies linearly with the angular position of the transducer shaft. AC operation eliminates the need for integrated signal conditioning components thereby offering the user an extremely wide operating temperature range of -55°C to 150°C .

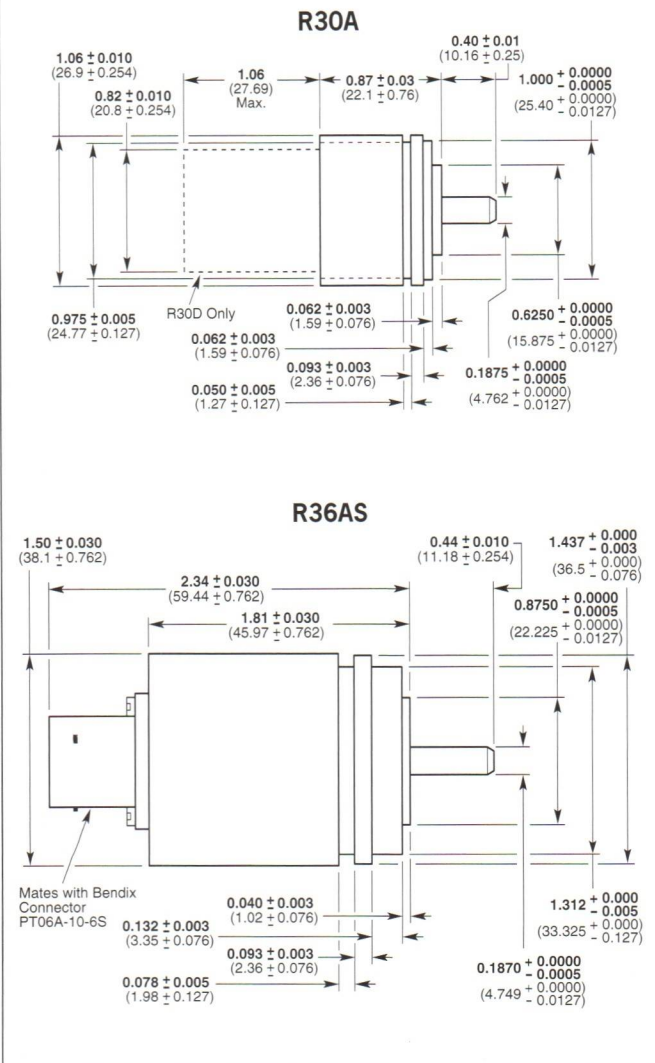
Factory calibrated to operate over a ± 30 degree range, both the R30A and R36AS offer a nonlinearity of less than $\pm 0.5\%$ of full scale and sensitivity of $2.2 \text{ mV/Vin}_{\text{rms}}/\text{degrees}$. Extended range operation up to a maximum of $\pm 60^{\circ}$ is possible with compromised linearity.

The R36AS is distinguished from the R30A in that it incorporates a more rugged stainless steel size 15 package, and MS style connector. The R30A is packaged in a smaller size 11 aluminum housing with flying lead termination for slightly less aggressive applications.

Both transducers offer superb performance and long term reliability for applications such as machine tool equipment, valve positioning, and rotary actuator feedback.



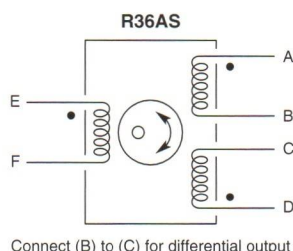
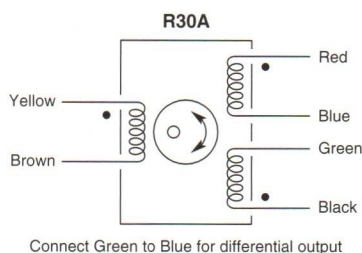
Dimensions in (mm)



Specifications

| | R30A | R36AS |
|--|--|---|
| Full Range | ±60° | ±60° |
| Linear Range | ±30° | ±30° |
| Input Voltage (nominal) | 3 V rms | 3 V rms |
| Input Frequency | 10 kHz | 2.5 kHz |
| Sensitivity | 2.9 mVo/Vi/Degrees | 2.2 mVo/Vi/Degrees |
| Primary DCR | 83.4 Ohms | 265 Ohms |
| Secondary DCR | 444 Ohms | 1130 Ohms |
| Input Impedance | 125 Ohms (@ null) | 750 Ohms (@ null) |
| Output Impedance | 500 Ohms (@ full scale) | 2000 Ohms (@ full scale) |
| Phase Shift | +35° | +4° |
| Linearity Error | ±0.5 % of full scale output | ±0.5% of full scale output |
| Operating Temperature Range | -65°F to 300°F (-55°C to 150°C) | -65°F to 300°F (-55°C to 150°C) |
| Temperature Coefficient of FS | ±0.02% of FS/20 to 160°F (±0.04% of FS/-5 to 75°C) | ±0.02% of FS/20 to 160°F (±0.04% of FS/-5 to 75°C) |
| Null Voltage | 0.5% of full scale output | 0.5% of full scale output |
| Lead Wires | 28 AWG, Teflon® insulation, 6 wire minimum 12" long | Mates w/Bendix PTO6A-10-6S |
| Torque | 0.12 in-oz (8 gm-cm) | 0.75 in-oz (54 gm-cm) |
| Weight | 1.3 oz (36 gm) | 9 oz (255 gm) |
| Mounting | Size 11 servo mount BU-ORD | Size 15 servo mount BU-ORD |
| Bearings | Shielded ABEC 3 precision | Shielded ABEC 3 precision |
| Shaft Diameter | 3/16 in (4.76 mm) | 3/16 in (4.76 mm) |
| Axial Shaft Bearing Load Capability | 10 lbs (4.54 kg) | 25 lbs (11kg) |
| Radial Shaft Bearing Load Capability | 8 lbs (3.6 kg) | 25 lbs (11 kg) |
| Casing Material | Aluminum | Stainless Steel |

Wiring



How to Order

Specify by model number. R-Flex coupler available separately (see page 144).

| Model Number | Size | Range |
|--------------|------|-------|
| R30A | 11 | ±30° |
| R36AS | 15 | ±30° |

R30D RVDTs

DC-Operated Rotary Variable Differential Transformers

RVDTs incorporate a proprietary noncontact design that dramatically improves long term reliability when compared to other traditional rotary devices such as syncros, resolvers and potentiometers. This unique design eliminates assemblies that degrade over time, such as slip rings, rotor windings, contact brushes and wipers, without sacrificing accuracy.

High reliability and performance are achieved through the use of a specially shaped rotor and wound coil that together simulates the linear displacement of a Linear Variable Differential Transformer (LVDT). Rotational movement of the rotor shaft results in a linear output signal that shifts ± 60 (120 total) degrees around a factory preset null position. The phase of this output signal indicates the direction of displacement from the null point. Noncontact electromagnetic coupling of the rotor provides infinite resolution, thus enabling absolute measurements to a fraction of a degree.

Although capable of continuous rotation, most RVDTs are calibrated over a range of ± 30 degrees, with nominal nonlinearity of less than $\pm 0.25\%$ of full scale (FS). Extended range operation up to a maximum of ± 90 degrees is possible with compromised linearity.

R30D

The R30D RVDT is a DC operated noncontacting rotary transducer. Integrated signal conditioning enables the R30D to operate from a bipolar ± 15 VDC source with a high level DC output that is proportional to the full range of the device. Calibrated for operation to ± 30 degrees, the R30D provides a constant scale factor of 125 mVDC/degree. Nonlinearity error of less than $\pm 0.25\%$ FS is achieved while maintaining superior thermal performance over -18°C to 75°C .

The DC excitation is internally converted to an AC carrier signal which excites the transducer's primary coil. An integrated demodulator amplifier and filter convert the differential secondary output into a smooth, high level, DC output signal that is linear with the shaft angle position. Resolution is infinite enabling measurements to a fraction of a degree.

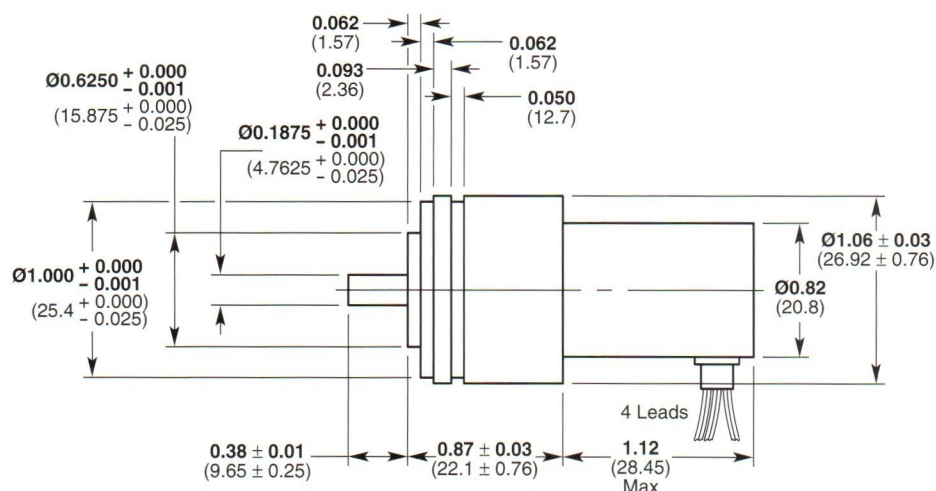
The R30D features a rugged aluminum size 11 housing making this rotary transducer ideal for applications where integrated signal conditioning and small size are required. Typical applications include hydraulic pump control, rotary actuator feedback, and throttle lever position feedback.



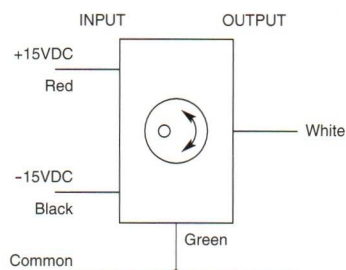
Specifications

| | |
|---------------------------|---|
| Full Range | $\pm 30^{\circ}$ |
| Input Voltage (nom) | ± 15 Vin DC |
| Scale Factor | 0.125 V/ $^{\circ}$ |
| Output Voltage (nom) ... | ± 3.75 VDC |
| Input Current (max) | 35 mA |
| Output Current (max) ... | 5 mA |
| Output Impedance | < 10 Ohms |
| Frequency Response | 500 Hz @ -3 dB |
| Linearity Error | $\pm 0.25\%$ of full scale output |
| Storage Temperature | |
| Range | -65°F to 250°F (-55°C to 125°C) |
| Operating Temperature | |
| Range | 0°F to 170°F (-18°C to 75°C) |
| Temperature | |
| Coefficient of FS | $\pm 0.02\%$ of FS/ 20°F to 160°F ($\pm 0.04\%$ of FS/ -5°C to 70°C) |
| Lead Wires | 28 AWG, Teflon [®] insulation, 4 wire, minimum 12" long |
| Torque | 0.12 in-oz (8 gm-cm) |
| Weight | 1.9 oz (53 gm) |
| Mounting | Size 11 servo mount BU-ORD |
| Bearings | Shielded ABEC 3 precision |
| Shaft Diameter | 3/16 in (4.76 mm) |
| Axial Shaft Bearing | |
| Load Capability | 10 lbs (4.54 kg) |
| Radial Shaft Bearing | |
| Load Capability | 8 lbs (3.6 kg) |
| Casing Material | Aluminum |

Dimensions in (mm)



Wiring



How to Order

Specify by model number. R-Flex coupler available separately (see page 144).

| Model Number | Size | Range |
|--------------|------|-------|
| R30D | 11 | ±30° |

R60D RVIT

DC-Operated Rotary Variable Inductance Transducer

RVITs are DC operated noncontact rotary transducers. The RVIT proprietary design incorporates a set of printed circuit coils and a conductive spoiler to achieve superior performance and low cost. During operation, the conductive spoiler rotates with the transducer shaft, altering the magnetic field generated by the printed circuit coils. The resulting unbalance is precisely measured using a patented autoplexing circuit. This signal is then converted to a linear DC output signal that is directly proportional to the angle of the rotor shaft. The predominantly digital circuit is very resistant to environmental disturbances and is ideally compatible for use with most digital electronics.

RVITs are available with a choice of standard face mounting or optional four hole flange mounting. A shaft seal is available with flange mounting for applications where contamination is critical. RVITs offer wide operating temperature range, infinite resolution, and a virtually infinite rotational life.

R60D

The R60D rotary transducer is a shorter version of the R30D. Calibrated for use over ± 60 degrees, the R60D offers improved range without sacrificing other performance parameters.

The R60D also has improved resistance to electromagnetic disturbances and built in voltage regulation for guaranteed operation in applications where high noise environments exist. Typical applications include ball valve position feedback, throttle and position level feedback and actuation feedback.

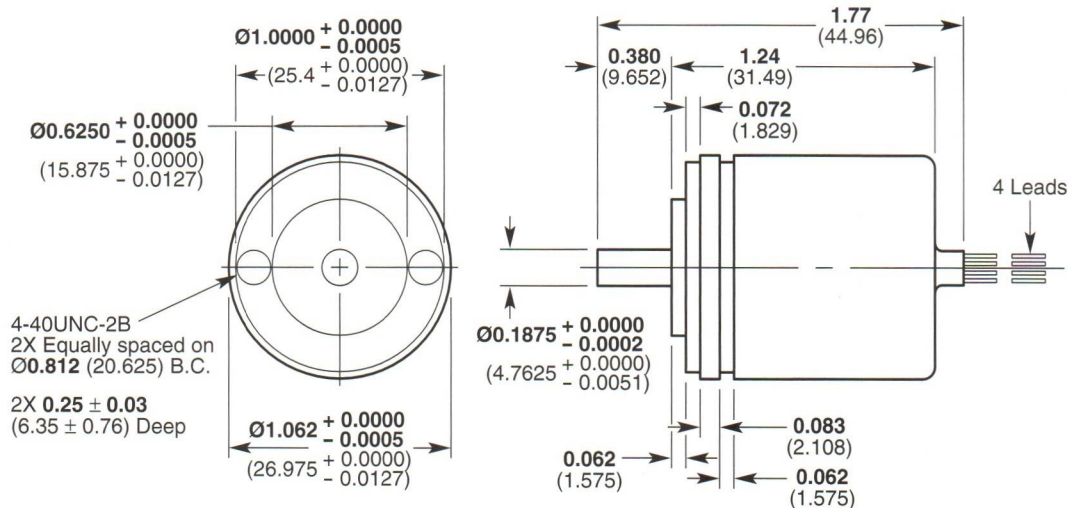


Specifications

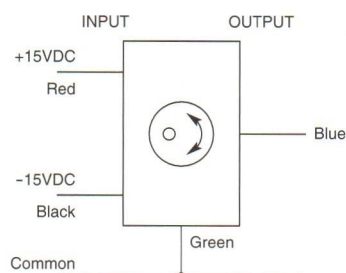
| | |
|---|--|
| Full Range | $\pm 60^\circ$ |
| Input Voltage (nom) | ± 15 VDC |
| Scale Factor | 0.125 V/ $^\circ$ |
| Output Voltage (nom) ... | ± 7.5 VDC |
| Input Current (max) | 21 mA |
| Output Current (max) ... | 5 mA |
| Output Impedance | <1 Ohms |
| Frequency Response | 200 Hz @ -3 dB |
| Linearity Error* | $\pm 0.50\%$ of full scale output |
| Nonrepeatability & Hysteresis (max) | 0.1% of full scale range output maximum |
| Storage Temperature Range | -65°F to 250°F (-55°C to 125°C) |
| Operating Temperature Range | -13°F to 185°F (-25°C to 85°C) |
| Temperature Coefficient of FS | $\pm 0.02\%$ of FS/20°F to 160°F ($\pm 0.04\%$ of FS/-5°C to 70°C) |
| Lead Wires | 24 AWG, PVC insulation, 4 wire, minimum 12" long |
| Torque | 0.12 in-oz (8 gm-cm) |
| Weight | 1.2 oz (34 gm) |
| Mounting | Size 11 servo mount BU-ORD |
| Bearings | Matched and preloaded ABEC 3 |
| Shaft Diameter | 3/16 in (4.76 mm) |
| Axial Shaft Bearing Load Capability | 10 lbs (4.54 kg) |
| Radial Shaft Bearing Load Capability | 10 lbs (4.54 kg) |
| Casing Material | Aluminum |

* Units with improved linearity available. Consult factory.

Dimensions in (mm)



Wiring



How to Order

Specify by model number. R-Flex coupler available separately (see page 144).

| Model Number | Size | Range |
|--------------|------|-------|
| R60D | 11 | ±60° |

RVIT-15-60/RVIT-15-120I RVITs

DC-Operated Rotary Variable Inductance Transducers

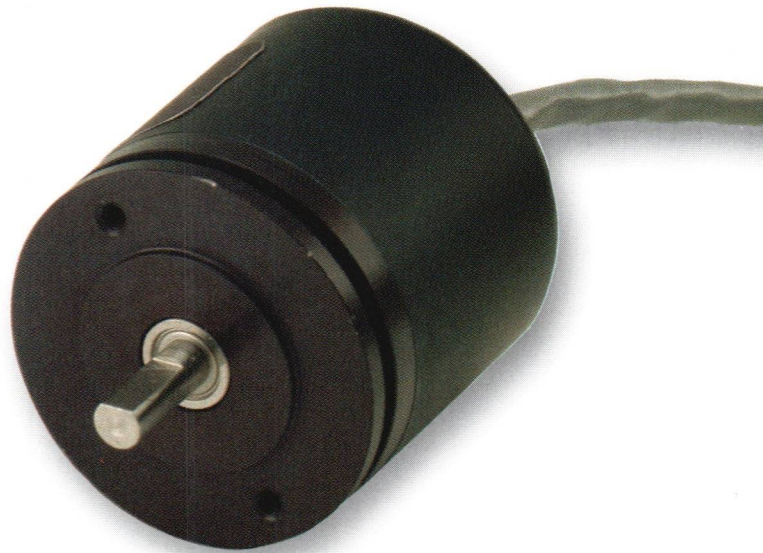
RVITs are DC operated noncontact rotary transducers. The RVIT proprietary design incorporates a set of printed circuit coils and a conductive spoiler to achieve superior performance and low cost. During operation, the conductive spoiler rotates with the transducer shaft, altering the magnetic field generated by the printed circuit coils. The resulting unbalance is precisely measured using a patented autoplexing circuit. This signal is then converted to a linear DC output signal that is directly proportional to the angle of the rotor shaft.

The predominantly digital circuit is very resistant to environmental disturbances and is ideally compatible for use with most digital electronics. For original equipment manufacturers who desire a microprocessor interface, a pulse width modulated output can be supplied as a special order option. Other specialized options for volume applications include, regulated single or bipolar excitation, extended operating ranges, and custom calibration.

RVITs are available with a choice of standard face mounting or optional four hole flange mounting. A shaft seal is available with flange mounting for applications where contamination is critical. RVITs offer wide operating temperature range, infinite resolution, and a virtually infinite rotational life.

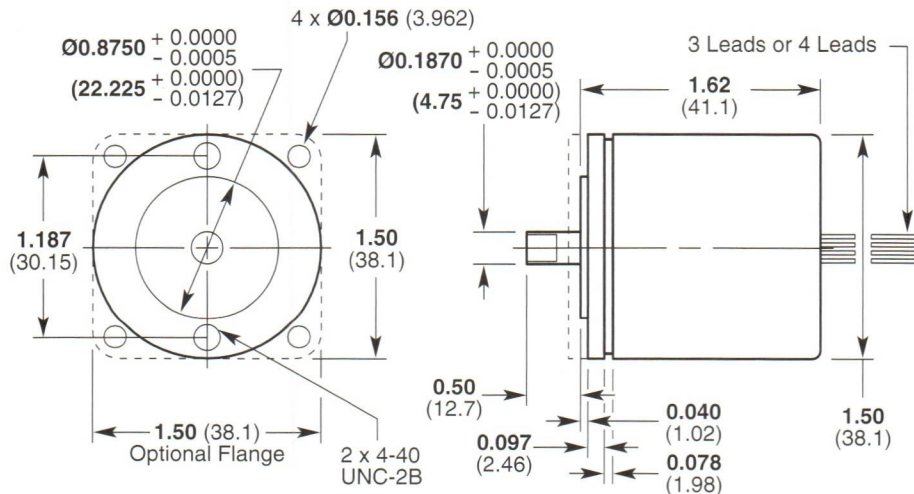
RVIT-15-60 and RVIT-15-120I

The RVIT-15-60 and RVIT-15-120I rotary transducers are available in a variety of versions which provide a range of supply and output configurations. Calibrated outputs of ± 3 VDC and 4-20 mA offer ideal flexibility for specialized OEM designs where unique power supply and interfacing requirements exist. Other specialized ranges, internal regulation and custom calibrated outputs are available for special order.



The standard RVIT 15-60 transducer emulates a potentiometer in that any change in input voltage results in a proportional change in output voltage. Although this output is ratiometric, the RVIT-15-60 offers a considerably higher scale factor of 50 mV per degree over an extended range of ± 60 degrees. In addition, the noncontact design of the RVIT provides virtually infinite rotational life and extremely high accuracy of $\pm 0.25\%$ FS.

Dimensions in (mm)

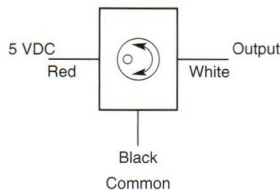


Specifications

| | RVIT-15-60 | RVIT15-120I |
|--|--|--|
| Full Range | ±60° | 0 to 120° |
| Input Voltage (nom) | +5 VDC | 10-24 VDC |
| Scale Factor | 0.050 | 0.13 mA/° |
| Output Voltage (nom) | ±3 VDC | +1 to +5 VDC (with 250Ω load) |
| Input Current (max) | 14 mA | 41 mA |
| Output Current (max) | 5 mA | 4-20 mA |
| Output Impedance | <1 Ohms | <250 Ohms |
| Frequency Response | 25 Hz @ -3 dB | 25 Hz @ -3 dB |
| Linearity Error | ±0.25% of full scale output | ±0.25% of full scale output |
| Nonrepeatability & Hysteresis (max) | ±0.1% of full scale range output | ±0.1% of full scale range output |
| Storage Temperature Range | -65°F to 250°F (-55°C to 125°C) | -13°F to 185°F (-25°C to 85°C) |
| Operating Temperature Range | -13°F to 185°F (-25°C to 85°C) | -13°F to 185°F (-25°C to 85°C) |
| Temperature Coefficient of FS | ±0.02% of FS/20°F to 160°F (±0.04% of FS/-5°C to 70°C) | ±0.02% of FS/20°F to 160°F (±0.04% of FS/-5°C to 70°C) |
| Lead Wires | 26 AWG, PVC insulation, PVC jacket, 3 or 4 wire depending on configuration, minimum 12 inch long | 26 AWG, PVC insulation, PVC jacket, 3 or 4 wire depending on configuration, minimum 12 inch long |
| Torque | 0.12 in-oz (8 gm-cm) | 0.12 in-oz (8 gm-cm) |
| Weight | 2.47 oz (70 gm) | 2.47 oz (70 gm) |
| Mounting | Size 15 servo or flange mount BU-ORD | Size 15 servo or flange mount BU-ORD |
| Bearings | Matched and preloaded ABEC 3 | Matched and preloaded ABEC 3 |
| Shaft Diameter | 3/16 in (4.76 mm) | 3/16 in (4.76 mm) |
| Axial Shaft Bearing Load Capability | 10 lbs (4.54 kg) | 10 lbs (4.54 kg) |
| Radial Shaft Bearing Load Capability | 10 lbs (4.54 kg) | 10 lbs (4.54 kg) |
| Casing Material | Aluminum | Aluminum |

Wiring

RVIT-15-60

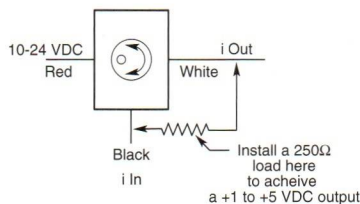


How to Order

Specify by model number. R-Flex coupler available separately (see page 144).

| Model Number | Size | Range |
|--------------|------|-----------|
| RVIT-15-60 | 15 | ±60° |
| RVIT-15-120I | 15 | 0 to 120° |

RVIT-15-120I



Low Profile Design for OEM Applications

Schaevitz® has developed the first in a series of flat non-contact rotary displacement sensors known as the RVIT-Z series. The unique design of the RVIT-Z incorporates the proprietary RVIT (Rotary Variable Inductive Transformer) technology and signal conditioning circuitry on a single PCB. The RVIT-Z provides an ultra low profile, high accuracy solution for rotary and angular measurements in OEM applications. The lack of wipers, brushes, slip rings or magnetic materials eliminates wear, static friction, hysteresis and electrical noise.

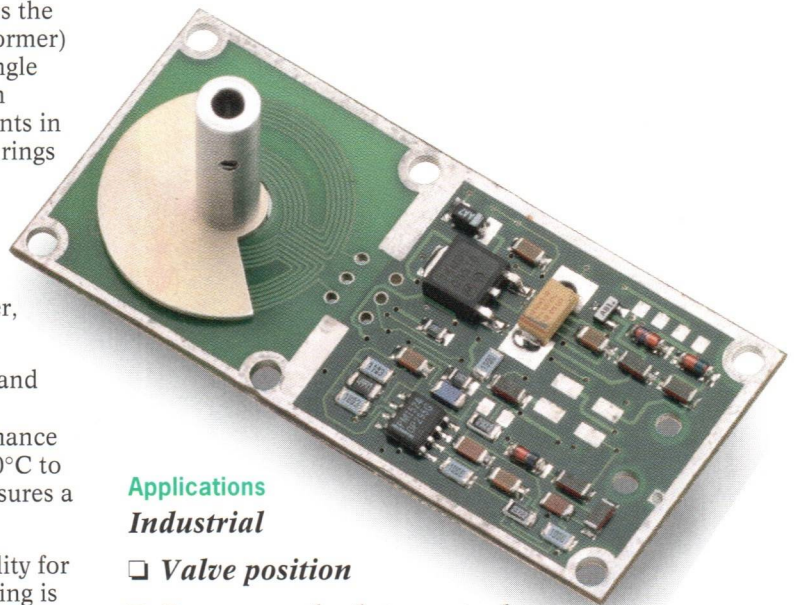
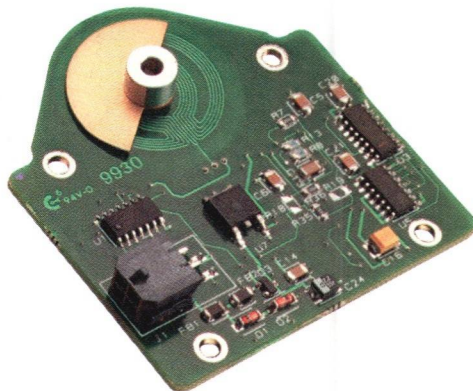
Measuring a fraction the size of other rotary positioning sensors, the RVIT-Z is ideal for space critical rotary sensing applications; it is smaller, flatter and lighter than conventional rotary sensors.

Capable of absolute rotary measurement over $\pm 60^\circ$, and extended operation up to $\pm 75^\circ$ (with compromised linearity), the RVIT-Z provides unsurpassed performance over an extended operating temperature range of -40°C to 125°C . Factory calibration and automated testing assures a nonlinearity error of less than $\pm 0.5\%$ of full scale.

The RVIT-Z provides a high degree of design flexibility for custom designs. For applications where remote sensing is required, the RVIT-Z can be tailored allowing the rotary sensing element to remain separated from the electronic circuitry by up to 12 inches.

Features

- ☐ **OEM modular design**
- ☐ **Low cost**
- ☐ **Contactless, no brushes to wear**
- ☐ **Absolute rotary measurements**
- ☐ **Linear range of $\pm 60^\circ$ or 0° to 120°**
- ☐ **Capability for various inputs/outputs**
- ☐ **Extremely light weight**
- ☐ **Flat surface mount design**
- ☐ **Thin profile**



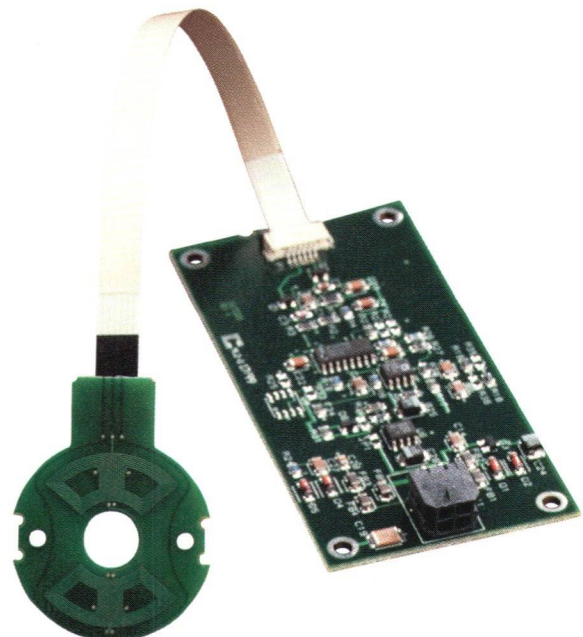
Applications

Industrial

- ☐ **Valve position**
- ☐ **Pump swash plate controls**
- ☐ **Robotics**
- ☐ **HVAC, vane position control**
- ☐ **Potentiometer replacement**

Automotive

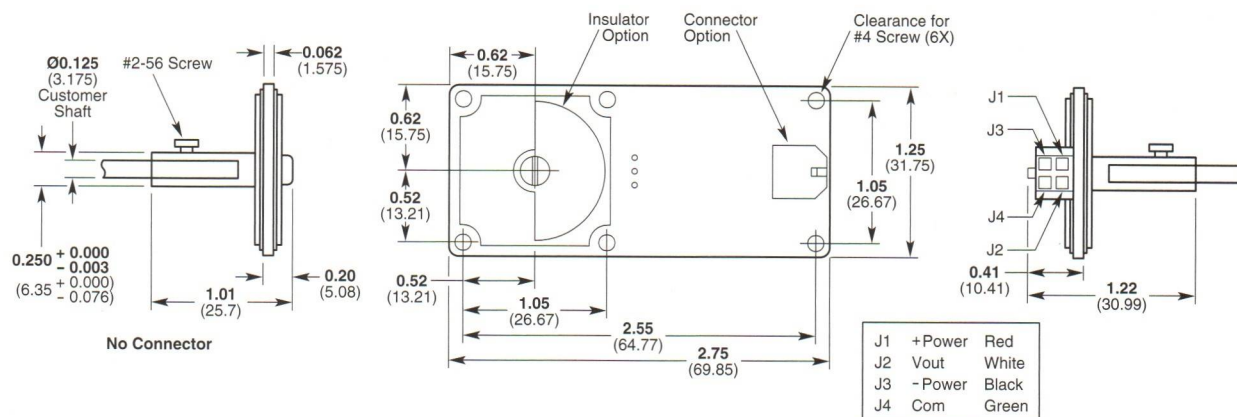
- ☐ **Pedal/throttle position sensor**
- ☐ **Automatic suspension**
- ☐ **Transmission position switch**
- ☐ **Potentiometer replacement**



Specifications

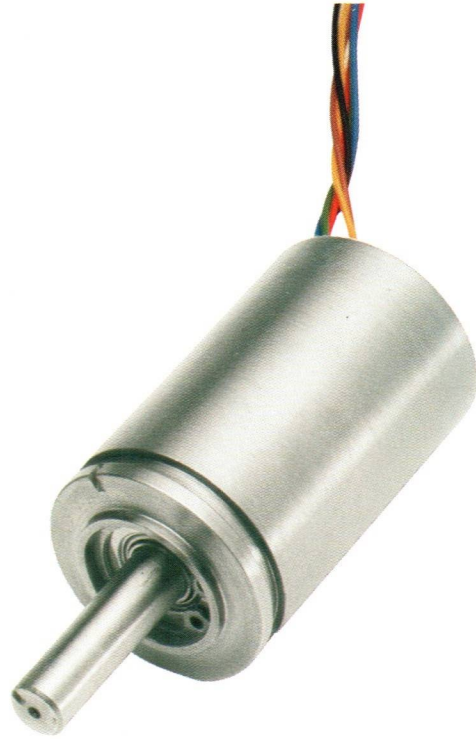
| | |
|---|---|
| Linear Range | ±60° (output is monotonic up to ±90°) |
| Nonlinearity | ±0.5% of FS (max) |
| Scale Factor | Factory adjustable |
| Input Voltage | +5, +10 to +28, ±15 VDC |
| Output Voltage | Factory scalable (consult factory) |
| Input/Output Options: | |
| +5 VDC Regulated | |
| Single Rail | Unipolar output (ie. 1 to 4 VDC, 0°set at 2.500 VDC) Bipolar output (ie. ±2.5 VDC, 0°set at 0.000 VDC) |
| +10 to +28 VDC, Unregulated Single Rail | |
| Unipolar output (ie. 1 to 4 VDC, 0°set at 2.500 VDC) Bipolar output (ie. ±2.5 VDC, 0°set at 0.000 VDC) | |
| ±15 VDC Unregulated | |
| Single Rail | Unipolar output (ie. 1 to 4 VDC, 0°set at 2.500 VDC) Bipolar output (ie. ±10 VDC, 0°set at 0.000 VDC) |
| PWM (Pulse Width Modulation) Output | Mark/space ratio PWM output, TTL load capable |
| Input Current | 18 mA max |
| Temperature Range | -25°C to 85°C |
| Temperature Coefficient | |
| of Full Scale | ±0.02% of FS/°C |
| Connections | 3 or 4 wire, 26 AWG cable, Teflon insulated |
| Connector | Molex 43045-0406, keyed with lock. Mating connector sold separately |
| Mounting | 6 x #4-40 screws |
| Bearing | Consult factory for bearing options |

Dimensions in (mm)



RSYN Series

Rotary Sensors for Hostile Environments



RSYN angular position sensors are non-contact transducers that incorporate proprietary rotor and coil designs. Their basic construction eliminates items such as slip rings, rotor windings, contact brushes or wipers that degrade over time and impair reliability. At the same time the coil design achieves extraordinarily high output and low noise.

RSYNs offer enhanced tolerance to shock and vibration. Shock survival to 30g with an 11 ms half-sine form and vibration tolerance to 20g over 15 to 2000 Hz make these transducers the obvious choice where severe conditions are expected. RSYNs are also resistant to humidity and salt mist. Excellent performance over a temperature range of -67° to 221°F (-55° to 105 °C) provides a significant advantage over comparable rotary sensors.

RSYN angular position sensors are compact. They are available in two sizes: the RSYN-8-30 which is 0.750 inches (19.05 mm) in diameter, and the RSYN-11-30 which is 1.06 inches (26.92 mm) in diameter. The coil design comprises a primary and two secondary windings all placed in the stator. There are no windings in the rotor. The secondary windings act as pickup coils detecting the flux change caused by rotation of the rotor. The stator core is a lamination stack of highly permeable magnetic alloy material and the rotor is made of the same material. A very small air gap separates these components.

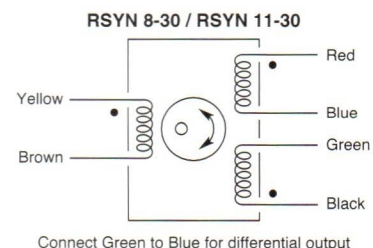
This combination provides for an “all-iron” flux path that provides for very high efficiency resulting in a very high signal to noise ratio and a very low temperature coefficient of scale factor. The linear a.c. output represents the rotor shaft angle position providing the user with exceptional resolution even over very small angular ranges. Both models offer the flexibility of six output leads to provide for a variety of connection schemes. Both models are factory calibrated over $\pm 30^\circ$. They may be over ranged to $\pm 35^\circ$, a total of 70° if necessary.

Applications

Long life and high reliability in aggressively hostile environments such as:

- ☐ ***Rotary valve position for process industries***
- ☐ ***Position feedback of head box spnnerets for paper or plastic***
- ☐ ***Hydrostatic transmissions for heavy off road vehicles***
- ☐ ***Rudder position on boats***

Wiring



Specifications

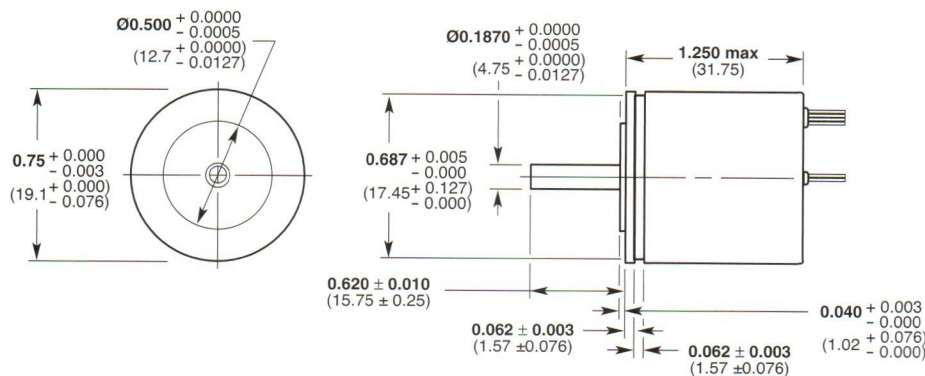
RSYN-8-30

RSYN-11-30

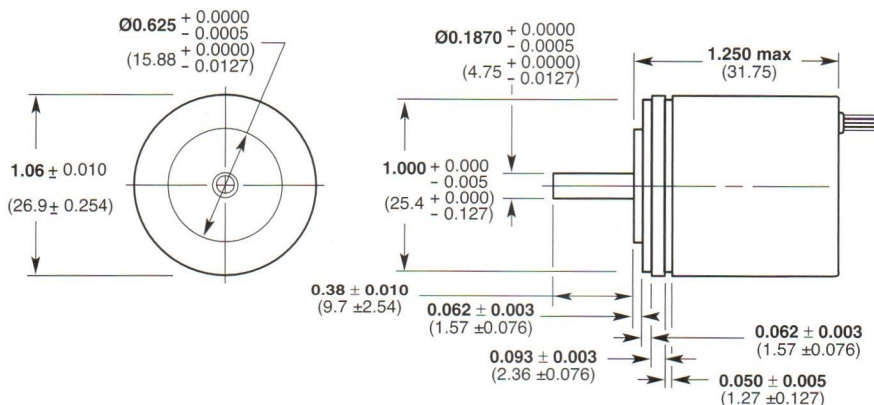
| | | |
|--|---------------------------------|---------------------------------|
| Range | ±30° | ±30° |
| Input Voltage (nominal) | 7.5 V rms | 7.5 V rms |
| Input Frequency | 3 kHz | 3 kHz |
| Primary DCR (nominal) | 62 Ohms | 46 Ohms |
| Secondary DCR (nominal) | 92 Ohms | 53 Ohms |
| Input Impedance | 424 Ohms (@ null) | 270 Ohms (@ null) |
| Output Impedance | 341 Ohms (@ full scale) | 199 Ohms (@ full scale) |
| Phase Shift | +5° | +7° |
| Sensitivity | 0.013 ±5% V/V/Deg | 0.011 ±5% V/V/Deg |
| Linearity | ±0.5 % of full scale output | ±0.5% of full scale output |
| Operating Temperature Range | -67°F to 221°F (-55°C to 105°C) | -67°F to 221°F (-55°C to 105°C) |
| Temperature Coefficient of FS | 0.02%/°C | 0.02%/°C |
| Null Voltage | 0.5% of full scale output | 0.5% of full scale output |
| Shock, 3 axes, ms. half sine | 30g | 30g |
| Vibration, 3 axes, random, 15 to 2000 Hz | 20g | 15g |
| Torque | 0.06 in-oz (4 gm-cm) | 0.06 in-oz (4 gm-cm) |
| Weight | 1.58 oz (45 gm) | 2.3 oz (65 gm) |
| Bearings, matched and preloaded | ABEC 3 | ABEC 3 |
| Axial Shaft Bearing Load Capability | 10 lbs (4.54 kg) | 10 lbs (4.54 kg) |
| Radial Shaft Bearing Load Capability | 10 lbs (4.54 kg) | 10 lbs (4.54 kg) |

Dimensions in (mm)

RSYN-8-30



RSYN-11-30



R-Flex™ Multipurpose Coupling

For use with all Schaevitz® Rotary Sensors

The R-Flex coupling is a versatile, easily installed rotary sensor coupling that corrects for most types of rotary sensor shaft misalignment. R-Flex provides excellent hysteresis free repeatability. The unique six-beam R-Flex design also provides superior performance under the most severe misalignment conditions. R-Flex is the perfect coupling for all Schaevitz® rotary sensors as it does not degrade the high level of repeatability and resolution of the transducer.

R-Flex is machined from high strength yet flexible 2024-T3.51 black anodized aluminum alloy. Six-beam construction prevents windup under most operating conditions and virtually eliminates coupling induced phase lag in high speed closed loop control applications.



Features

- ❑ *Eliminates windup*
- ❑ *Six-beam construction*
- ❑ *Integral clamps*
- ❑ *2024-T3.51 anodized aluminum*
- ❑ *Mates to multiple shaft sizes*

Benefits

Corrects for:

- ❑ *Angular alignment*
- ❑ *Parallel alignment*
- ❑ *Skewed alignment*
- ❑ *Axial motion*
- ❑ *Rotary oscillation*

Specifications

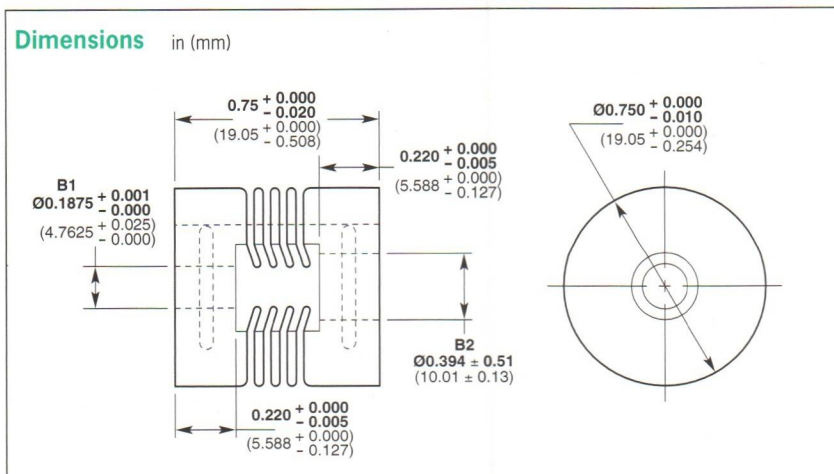
Dimensions:

| | |
|-----------------------|---|
| Diameter | 0.75" (19.05 mm) |
| Length | 0.75" (19.05 mm) |
| Clamping Length | .220" (5.59 mm) |
| Clamping Screw | 2-56 socket head cap screw |
| Bore Diameters | B1 = 0.1875" (+0.001 - 0.000) (4.76 mm) |
| | B2 = 10 mm, (bushings provided for: 0.187" and 0.250", 5 mm and 6 mm) |

Misalignment Correction:

| | |
|-----------------------|----------|
| Angular Offset | 5 degree |
| Parallel Offset | .008" |
| Axial Motion | .005" |

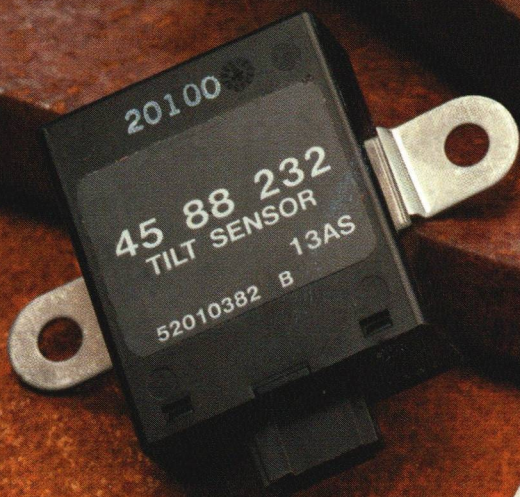
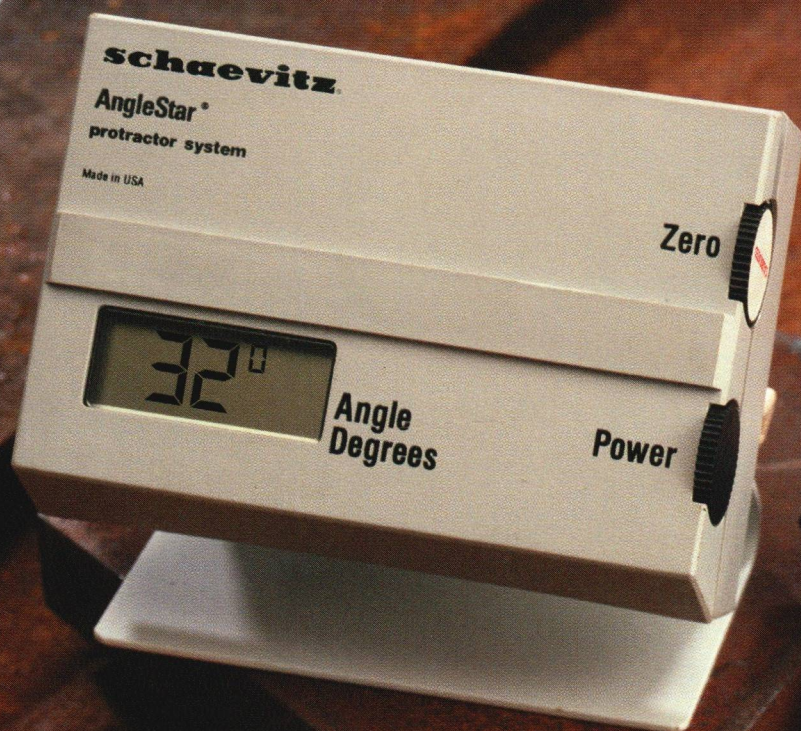
Dimensions in (mm)



How to Order

Specify by model number.

| | |
|-------|--------|
| Model | R-Flex |
|-------|--------|



Tilt Sensors

Tilt Sensors

A Choice of Technology



Schaevitz® manufactures a comprehensive line of electronic clinometers and systems for the precise measurement of level, angle or tilt. The unique, patented designs feature a wide range of performance parameters, interface, options and price alternatives.

Typical Applications

- ☐ *Wheel alignment*
- ☐ *Land navigation and auto security*
- ☐ *Construction equipment*
- ☐ *Motor homes and RVs*
- ☐ *Exercise equipment*
- ☐ *Marine*
- ☐ *Oil well pump control*
- ☐ *Machine tools and heavy machinery*
- ☐ *Manlifts and cranes*
- ☐ *Farm and lawn equipment*
- ☐ *Antenna positioning*

Electronic Clinometer

AccuStar®



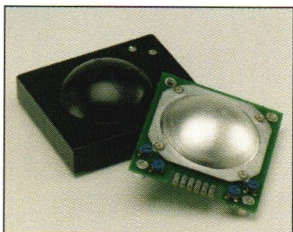
Page 148

The AccuStar® electronic clinometer offers high performance, low cost, and versatile design capabilities.

- Resolution of 0.001° and a $\pm 60^\circ$ range
- Rugged, high impact package just 2" in diameter
- Easily integrated into a wide variety of applications
- Choice of analog, ratiometric, digital pulse width, or serial output

Dual Axis Electronic Clinometers

AccuStar® II/DAS 20



Page 154

This revolutionary angle measurement sensor combines the function of two clinometers in one package. AccuStar® II/DAS 20 provides output signals directly proportional to the relative tilt of two axes at right angles to each other.

- Pin selectable analog or digital output
- Comparably priced, but with capabilities far superior to mercury switches or other low cost level sensors

AccuStar® II DAS 30



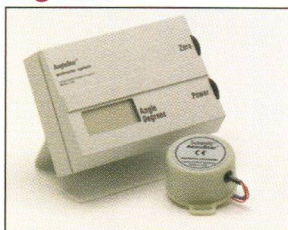
Page 156

The DAS-30 is a miniature dual axis sensor designed to meet the needs of OEM high volume designs for automotive, off-road vehicles and heavy equipment applications.

- $\pm 30^\circ$ operation in a unique PC board mountable design
- Proprietary dome shaped construction
- Operating temperature range of -40° to 85°C offers extended performance in rugged conditions

Electronic Protractor System

AngleStar®



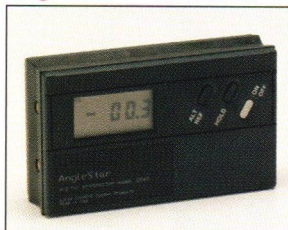
Page 157

A two part system including a capacitance-based electronic sensor and an LCD readout.

- Angular position is displayed digitally with a resolution of 0.1° or 0.01°
- Sensor can be mounted up to 200 feet (60 meters) from the readout
- Three standard display models offer a choice of range and resolution

Digital Protractor

AngleStar® – Model DP 45



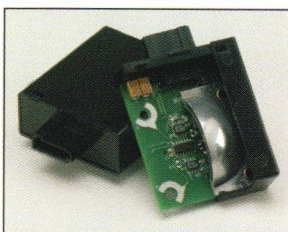
Page 158

Provides instant digital display of level, angle and tilt.

- Easy-to-use, hand held battery powered package
- Digital display eliminates the need to interpret a bubble or vernier scale
- Reads in degrees

Alarm Triggering Clinometer

Tilt Car Alarm – New Dome Technology for Exterior and Automotive Applications



Page 159

The Tilt Car Alarm is a fully conditioned dual axis tilt sensor with the added feature of alarm triggering.

Dual Axis Tilt Switch

AccuSwitch™



Page 160

AccuStar® Electronic Clinometer

Single Axis $\pm 60^\circ$ Range

The AccuStar® Electronic Clinometer is an extremely accurate angle measurement device. This compact and rugged sensor is ideal where space is critical and environmental conditions are serious design concerns.

The heart of the system is a patented, capacitance-based sensor with no moving parts. When rotated about its sensitive axis, this unique sensor provides an exceedingly linear variation in capacitance, which is electronically converted into angular data. The sensor and low-power CMOS electronics are encased in a rugged plastic housing ready to install as a system component or as a stand-alone device.

Designed for easy integration, with a choice of analog, ratiometric, digital or serial models, the clinometer produces an output signal corresponding to direction and magnitude of angular displacement.

Features

- ☐ *CE certified*
- ☐ *Just 2" in diameter*
- ☐ *Rugged plastic housing*
- ☐ *Extremely accurate*
- ☐ *Weighs only 2 oz.*

Applications

- ☐ *Wheel alignment*
- ☐ *Construction equipment*
- ☐ *Antenna positioning*
- ☐ *Robotics*



Performance Specifications

| | |
|-----------------------------|-----------------|
| Total Range | $\pm 60^\circ$ |
| Linear Range | $\pm 45^\circ$ |
| Threshold | 0.001° |
| Linearity | |
| Null to 10° | $\pm 0.1^\circ$ |
| 10 to 45° | $\pm 1\%$ |
| 45 to 60° | Monotonic |
| Null Repeatability | 0.05° |
| Cross Axis Error | <1% up to 45° |
| Time Constant | 0.3 sec |
| Freq. Response (-3db) | 0.5 Hz |
| RF Susceptibility | < $\pm 2^\circ$ |

Environmental Specifications

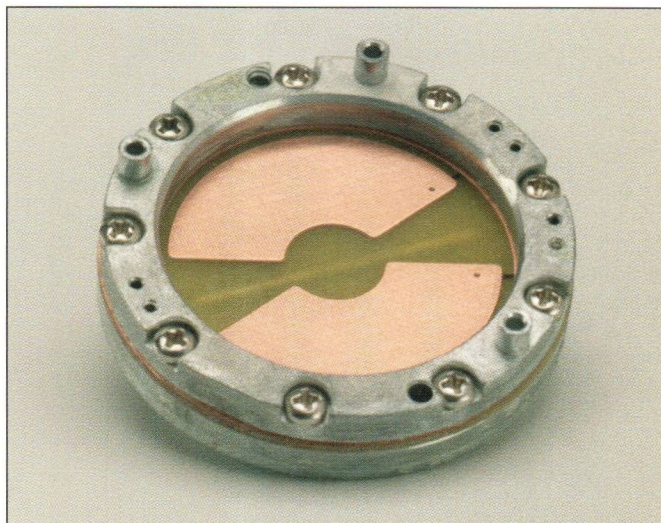
| | |
|-------------------------------|---|
| Temperature Range | |
| Operating | -30° to 65°C |
| Storage | -55° to 65°C |
| Temperature Coefficient | |
| Null | 0.008°/°C |
| Scale Factor | 0.1%/°C |
| EMC | |
| Emissions | EN55022 (CISPR 22) Limit B |
| Radiated Immunity | IEC 801-3 Level 3 10V/m |
| Burst Transients | IEC 801-4 Level 3 (2 kV) |
| ElectroStatic Discharge | IEC 801-2 Level 2 (8 kV air, 6 kV contact) |
| Conducted RF | MIL-STD 461D, CS114, Curve 2 |
| Cable Length | 18" standard length with flying lead terminator |

Design Concept

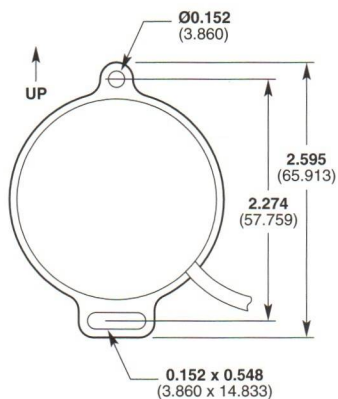
The unique design is based on a common capacitor plate sandwiched between sensor housing halves. The plate has been etched to form two variable capacitors. The assembled sensor is half filled with a dielectric liquid and inert gas. Rotation of the sensor produces a linear change in capacitance resulting in a corresponding output signal.

How to Order

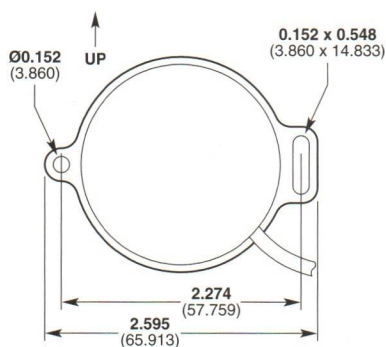
| Model Number | Description |
|--------------|--------------------|
| | Ratiometric |
| 02110002-000 | Vertical Flange |
| 02110102-000 | Horizontal Flange |
| | Analog |
| 02111002-000 | Vertical Flange |
| 02111102-000 | Horizontal Flange |
| | Digital |
| 02112002-000 | Vertical Flange |
| 02112102-000 | Horizontal Flange |
| | Serial |
| 02113002-000 | Vertical Flange |
| 02113102-000 | Horizontal Flange |



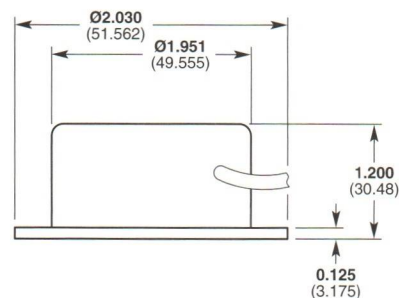
Dimensions in (mm)



Vertical Flange Mount



Horizontal Flange Mount



AccuStar[®] Electronic Clinometer

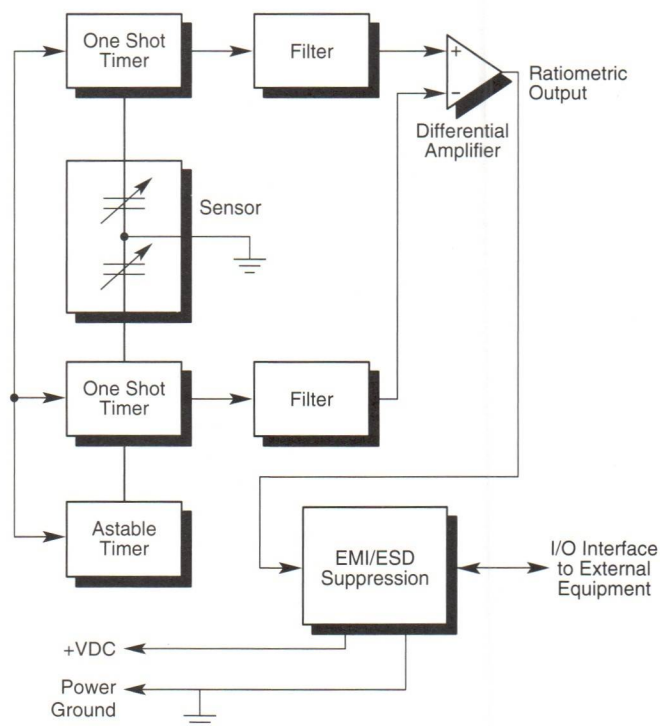
Ratiometric Output

Features

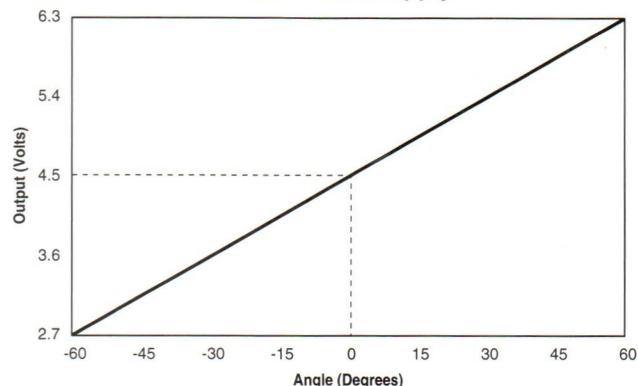
- ❑ **Low power consumption**
- ❑ **3 wire operation**

The Ratiometric clinometer is a signal conditioned sensor that has been designed to operate like a potentiometer. This is a three wire device: power; power ground; and signal. The signal is referenced to power ground. A regulated power supply is required since the output is supply dependent. The midscale output, zero degrees, is 1/2 the supply voltage while the scale factor is also supply dependent. With its low power consumption, 0.5 mA, this device is ideal for battery supplied applications. The Ratiometric clinometer was designed with EMI and ESD suppression circuitry on every line.

Ratiometric I/O Block Diagram



Ratiometric Output
with 9 VDC supply



Ratiometric Electrical Specifications

Voltage

Voltage Supply

Nominal +9 VDC
Range (regulated) +5 to +15 VDC

Current 0.5mA

Scale Factor

Nominal (@9VDC) 30mV/degree $\pm 10\%$

Load Resistance (min.) 10 kOhms

Level Output (0°) 1/2Vcc

Electrical Connections

| Wire | Source |
|--------|--|
| Black | Power ground |
| Red | Reg. +5 to +15 VDC |
| Yellow | Signal output (reference to power ground) |

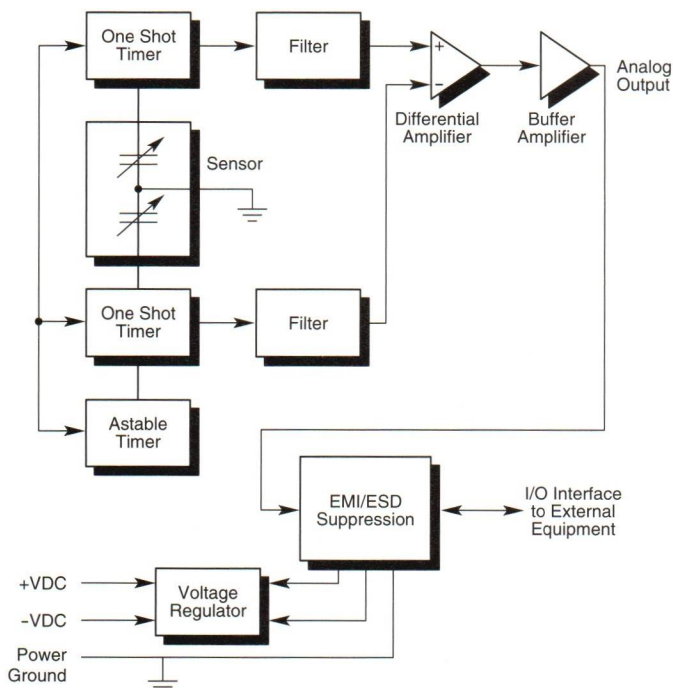
Analog Output

Features

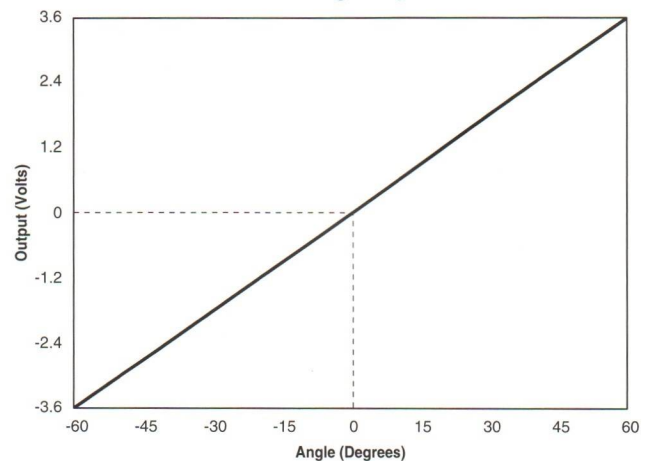
- ❑ *Internally regulated*
- ❑ *Bipolar input/output*

The Analog clinometer is a signal conditioned sensor which has been designed for dc voltage, bipolar operation. The clinometer requires a bipolar supply of ± 8 to ± 15 VDC and delivers an output of ± 3.6 VDC. This device is internally regulated for various applications. The output scale is fixed at a nominal 60mV per degree not dependent on the supply voltage. The Analog clinometer has full EMI and ESD suppression circuitry on every line.

Analog I/O Block Diagram



Analog Output



Analog Electrical Specifications

Voltage

Voltage Supply

Nominal ± 12 VDC

Range (regulated) ± 8 to ± 15 VDC

Current 5 mA/supply

Scale Factor 60 mV/degree $\pm 10\%$

Load Resistance (min.) 10 kOhms

Level Output (0°) 0 VDC

Electrical Connections

| Wire | Source |
|-------------|--|
| Black | Power ground |
| Red | +8 to +15 VDC |
| Gray | -8 to -15 VDC |
| Blue | Signal output (reference to power ground) |

AccuStar® Electronic Clinometer

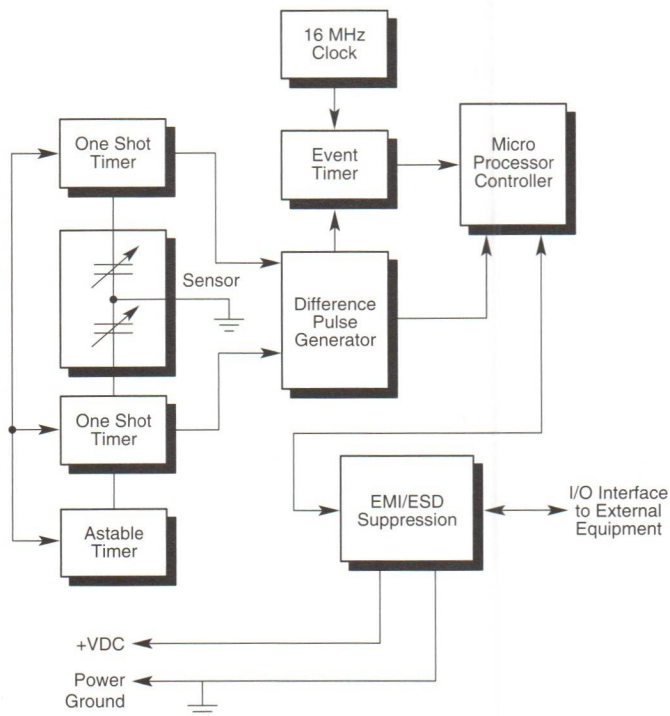
Serial Data Output

Features

- ❑ *Microcontroller compatible*
- ❑ *Ideal for noisy environments*

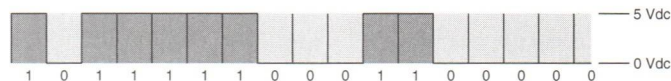
The Serial clinometer is a signal conditioned sensor which resolves the angle of tilt to 16 bits of information plus a polarity bit. This device was designed to transmit data to a microcontroller or to an I/O card of a PC through a three wire interface which will work at both TTL and CMOS logic levels. Complete handshaking is used to eliminate timing and transmission problems. The standard version operates on a +5 VDC regulated power supply while an internally regulated version is available. The Serial clinometer was designed with EMI and ESD suppression circuitry on every line.

Serial I/O Block Diagram



Example

+31.84° = 1 0111 1100 0110 0000



Contact factory for more details.

Serial Electrical Specifications

Voltage

Voltage Supply

| | |
|-------------------------|-----------------------------------|
| Range | +5 VDC, ±5% |
| Current | 15 mA |
| Scale Factor | 1000 counts/degree ±10% |
| Output | CMOS/TTL |
| Level Output (0°) | 0 counts |
| Binary Range | 16 bits + 1 bit polarity (serial) |

Electrical Connections

| Wire | Source |
|--------------|--------------|
| Black | Power ground |
| Red | +5 VDC |
| Yellow | Data |
| White | Request/Hold |
| Gray | Ready/Wait |

Digital Pulse Width Output

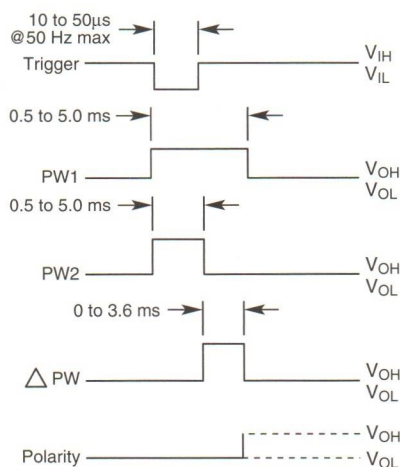
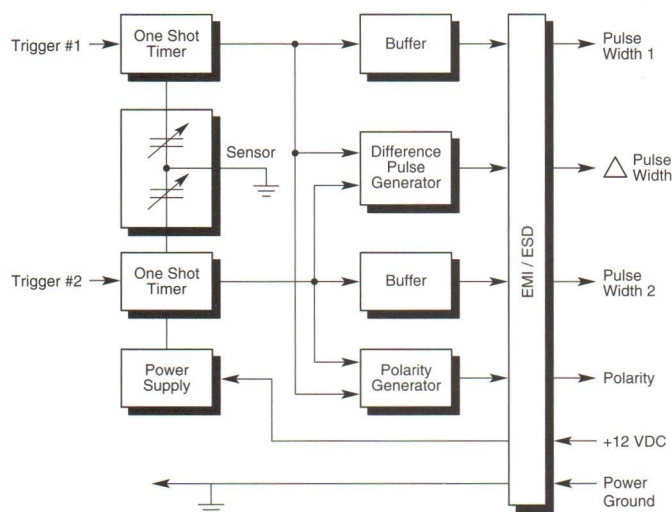
Features

□ **Internally regulated**

□ **Pulse width output**

The Digital Pulse Width clinometer is a signal conditioned sensor which resolves the angle of tilt to pulses, the length of which are directly proportional to the angle. When a trigger pulse is received on trigger 1 or trigger 2 a pulse is sent out the corresponding PW1 or PW2 line. Comparing the length of the two pulses determines the angle of the sensor. Triggering both lines together allows the user to read Delta PW which is the difference of PW1 and PW2. The polarity line will tell the user if the sensor is tilted clockwise or counterclockwise. The Digital Pulse Width clinometer was designed with EMI and ESD suppression circuitry on every line.

Digital I/O Block Diagram



V_{IH} (max) 5.3V
 V_{IH} (min) 3.0V
 V_{IL} (max) 0.8V
 V_{OH} (min) 4.95V
 V_{OL} (max) 0.05V
 Polarity updated on falling edge of ΔPW
 Polarity high CW, low CCW

Voltage output is TTL compatible. Each output can drive one low power Schottky or multiple CMOS devices.

Data Electrical Specifications

Voltage

Voltage Supply

Nominal 12 VDC

Range 8 to 15 VDC

Current 5 mA

Scale Factor $60 \mu\text{sec/degree} \pm 10\%$

Load Resistance 10K ohms

Level Output (0°) DPW = 0 sec.
 PW1 = PW2

Trigger Pulse

(CE version) 10 to 50 μsec @ 50 Hz max.

PW1/PW2 0.5 to 5 msec

ΔPW 0 to 3.6 msec

Polarity High (CW)
 Low (CCW)

Electrical Connections

| Wire | Source |
|--------|-------------|
| Black | Ground |
| Red | 8 to 15 VDC |
| Brown | Trigger 1 |
| Blue | Trigger 2 |
| Green | Polarity |
| Gray | PW1 |
| White | PW |
| Yellow | ΔPW |

AccuStar® II/DAS 20

Dual Axis Clinometer

AccuStar® II/DAS-20 combines the function of two clinometers in one package. The unique dome shaped design features a capacitance based sensor which produces output signals directly proportional to the relative tilt in two axes.

Designed for high volume applications, AccuStar® II/DAS-20 is priced to compete with much less capable mercury switches and other low cost level sensors.

There are four output connections providing a choice of ratiometric, pulse width modulation (PWM) digital output. A mating connector (sold separately) provides the user with an easy plug-in connection. Null and scale factor are adjustable.

Features

- ☐ *New microprocessor-based electronics*
- ☐ *Two clinometers in one package*
- ☐ *Adaptable design DC powered*
- ☐ *Ratiometric and PW digital output in one model*
- ☐ *Trimmable outputs*

Applications

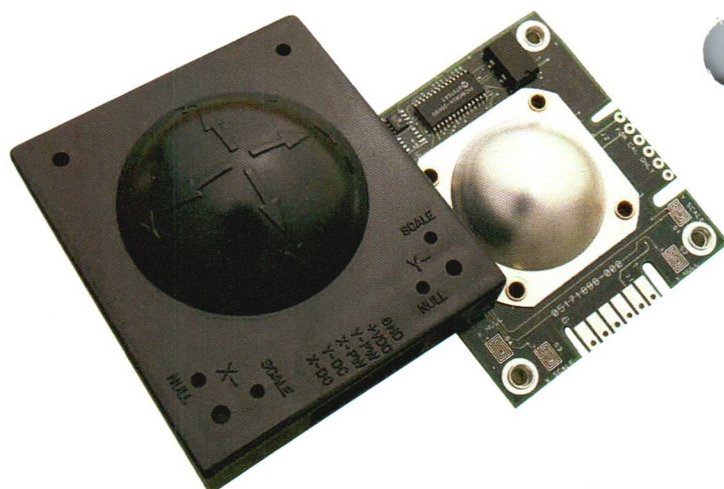
- ☐ *Platform leveling*
- ☐ *Measure pitch and roll*
- ☐ *Tip over protection for manlifts*
- ☐ *Automatic leveling systems*
- ☐ *Wheel alignment*

Performance Specifications

| | |
|---------------------------------|--|
| Range | ±20° |
| Threshold / Resolution | 0.01 |
| Linearity | |
| Null to 10° | ±0.2° |
| 10° to 12° | ±2.5% |
| 12° to 15° | ±3.0% |
| 15 to 20° | Monotonic |
| Null Repeatability..... | ±0.1 |
| Frequency Response (-3db) | 0.25 Hz (0.50 Hz available, consult factory) |

Environmental

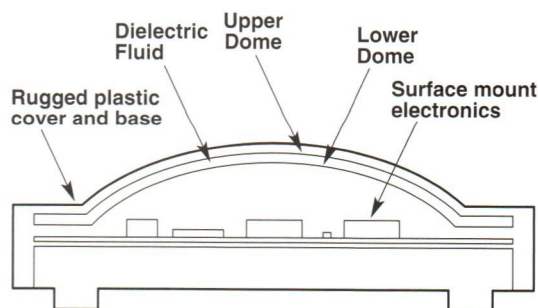
| | |
|---|--------------|
| Temperature Range | |
| Operating | -20° to 65°C |
| Storage | -55° to 65°C |
| Temperature | |
| Coefficient of Null | 0.01°/°C |
| Temperature Coefficient of Scale Factor | 0.10%/°C |



Electrical

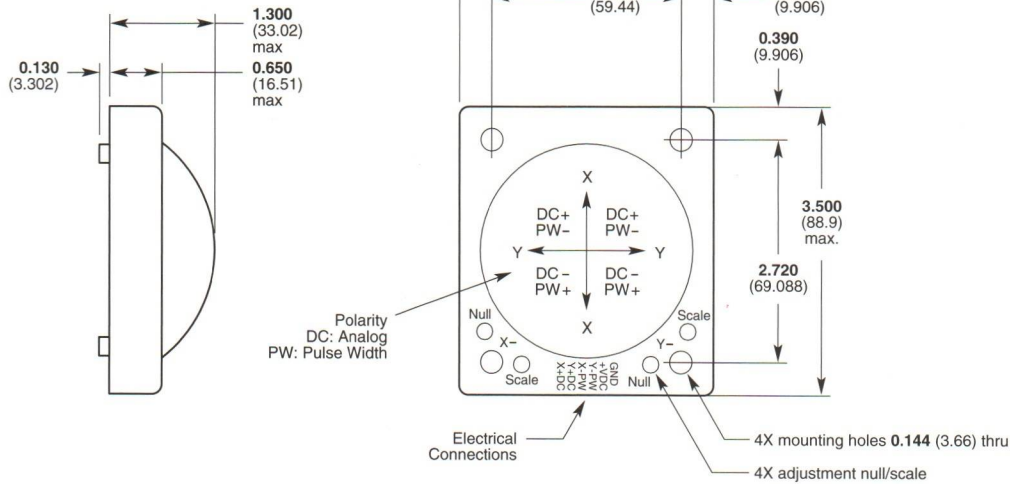
| | |
|----------------------------|---|
| Voltage Supply (nominal) | 9 VDC |
| Voltage Supply Range | Regulated 5.0 to 15.0 VDC |
| Current | 10 mA |
| Analog Output | |
| Scale Factor* @ 9 VDC | 100 mV/degree ±10% |
| Load Resistance (min) .. | 10K Ohms |
| Null Output | 1/2 supply voltage ±10% |
| Pulse Width Output | |
| Null | 50% (duty cycle) |
| Scale Factor | 0.7% / degree (nominal) |
| Duty Cycle | $t_2 / (t_1 + t_2)$ t_1 and t_2 varies from 0.2 to 0.7 msec |
| Frequency | 100 Hz nominal |

Physically the sensor is composed of two hermetically sealed domes spaced about 1/8" apart. The lower, polyester plastic dome has 4 capacitive plates while the aluminum, upper dome acts as a ground. A fluid with a high dielectric constant is sealed within the dome sandwich, leaving an air bubble space about the size of a quarter. The bubble is centered at level position and will move from one side to the other as the device is tilted.

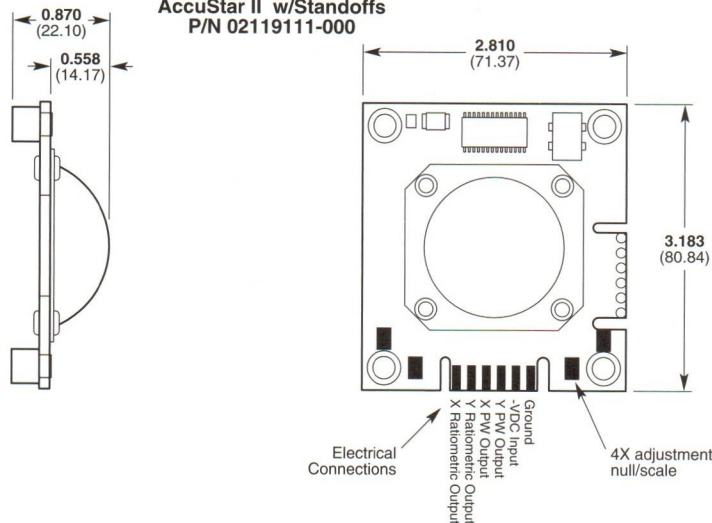


Dimensions in (mm)

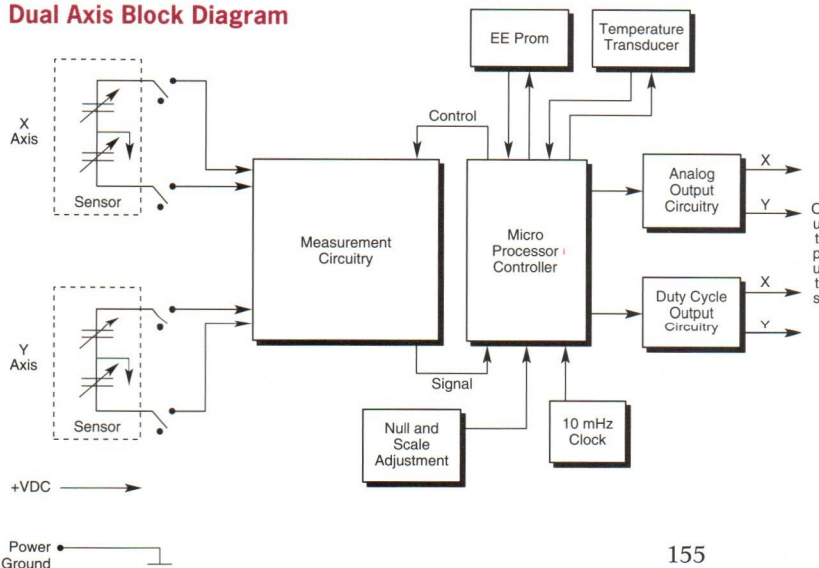
**AccuStar II w/Case
 P/N 02119011-000**



**AccuStar II w/Standoffs
 P/N 02119111-000**



Dual Axis Block Diagram



How to Order

| Part Number | Description |
|--------------|------------------------|
| 02119011-000 | Clinometer w/case |
| 02119111-000 | Clinometer w/standoffs |
| 09-01-1061A | Mating Molex connector |

Note: Connector is recommended for model 02119011-000 (Clinometer w/case).

AccuStar® II/DAS-30

Mini Dual Axis Dome – DAS 30

The AccuStar® II/DAS-30 miniature dual axis dome provides $\pm 30^\circ$ operation in a unique PC board mountable design. The proprietary dome shaped construction features a fluid filled sensor technology that delivers a linear variable capacitance output proportional to the angle of the sensor.

An operating temperature range of -40° to 85°C offers extended performance for use in rugged environmental conditions.

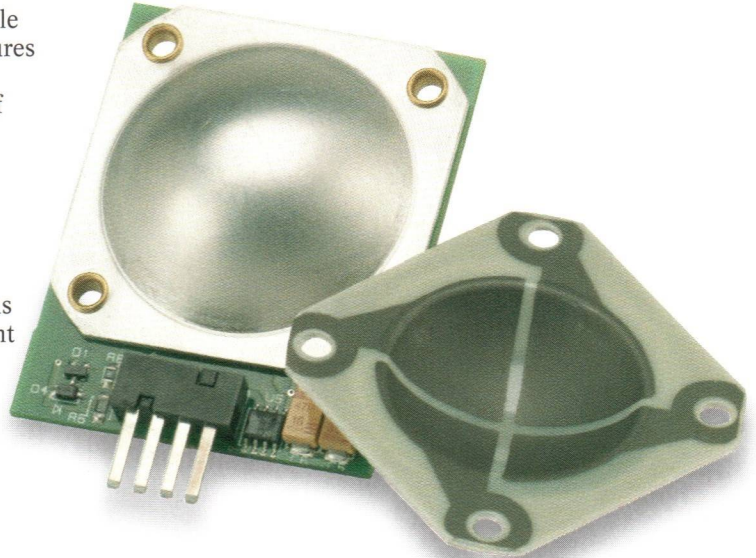
The AccuStar® II/DAS-30 miniature dual axis sensor is designed to meet the needs of OEM high volume designs for Automotive, Off-Road Vehicles and heavy equipment applications.

Features

- ❑ **Compact size**
- ❑ **Two axis sensing**
- ❑ **OEM/low cost design**

Applications

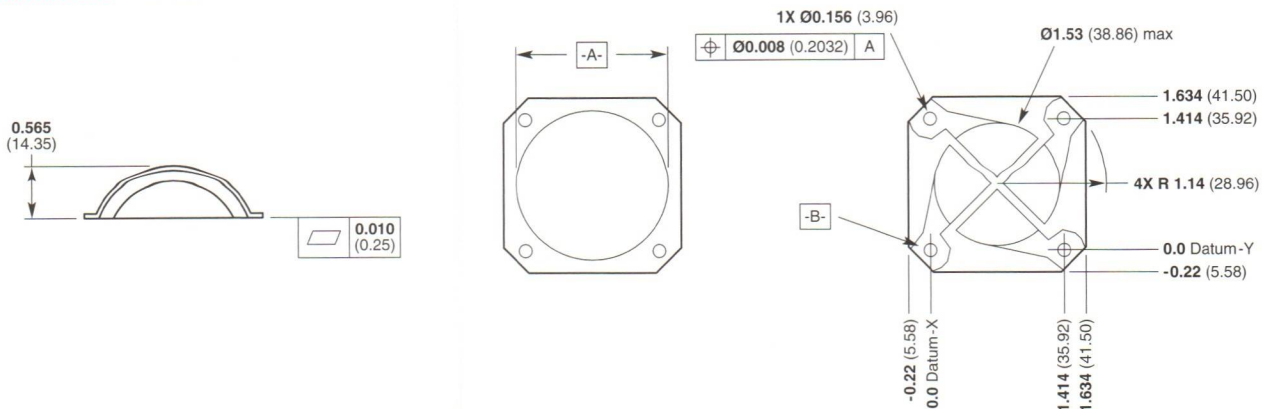
- ❑ **Leveling systems**
- ❑ **Automotive security system**
- ❑ **Off-road vehicles**



Performance Specifications

| | |
|-------------------------|---|
| Parameters | Frequency <3 kHz, Cs=50 pF |
| Range | |
| Total | $\pm 30^\circ$ |
| Linear | $\pm 20^\circ$ |
| Gain | 0.27% per arc-degree $\pm 0.007\%$ |
| Temperature Coefficient | |
| Scale | -0.10% per $^\circ\text{C}$ $\pm 0.15\%$ |
| Null | $\pm 0.025^\circ$ per $^\circ\text{C}$ |
| Offset at Null | $\pm 18^\circ$ arc-degree |
| Frequency change | $\pm 20\%$ |
| Linearity | Monotonic |
| Temperature Range | |
| Operating | -40°C to 85°C |
| Storage | -55°C to 85°C |

Dimensions in (mm)



Electronic Protractor System

Range: $\pm 20^\circ$, $\pm 45^\circ$ or $+90^\circ$
Resolution: 0.1° or 0.01°
Remote Sensing

The Anglestar® Protractor System (APS) is a ready to use, stand alone system for angle measurements. The system incorporates the AccuStar® Electronic Clinometer, a digital display, and a four foot cable. (Cable lengths up to 200 feet are available. Consult factory for details.) This system works on a 9 volt battery and needs no external power.

The display can be mounted up to 200 feet from the sensor. There are three systems to choose from, $\pm 20^\circ$ degrees with a 0.01 degree resolution, $\pm 45^\circ$, or a $+90^\circ$ with 0.1 degree resolution.

Features

- ❑ **Three-part system – sensor, LCD display and cable**
- ❑ **Remote sensing – 200 feet for display**
- ❑ **Ranges: $\pm 20^\circ$, $\pm 45^\circ$ or $+90^\circ$**

Applications

- ❑ **Platform leveling**
- ❑ **Antenna positioning**
- ❑ **Mining equipment**
- ❑ **Machine tooling**

Performance Specifications

Standard (P/N 02160001-000)

Linear Range $\pm 45^\circ$
Threshold & Resolution 0.1°

High Resolution (P/N 02160003-000)

Linear Range $\pm 19.99^\circ$
Threshold & Resolution 0.01°

90 Degree (P/N 02160005-000)

Linear Range 0° to 90°
Threshold & Resolution 0.1°

Linearity*

Null to 10° 0.1°
 10° to 45° $\pm 1\%$ of angle

Null Repeatability $\pm 0.1^\circ$

Cross Axis Error $< 1\%$ up to 45°

Sensor Time Constant 0.3 second

Sensor Frequency

Response 0.5 Hz

Electrical Specifications

Voltage Supply 9 volt battery

Battery Life (approx.) 1000 hours

Temperature Range -18° to 55°C

Interconnect Cable

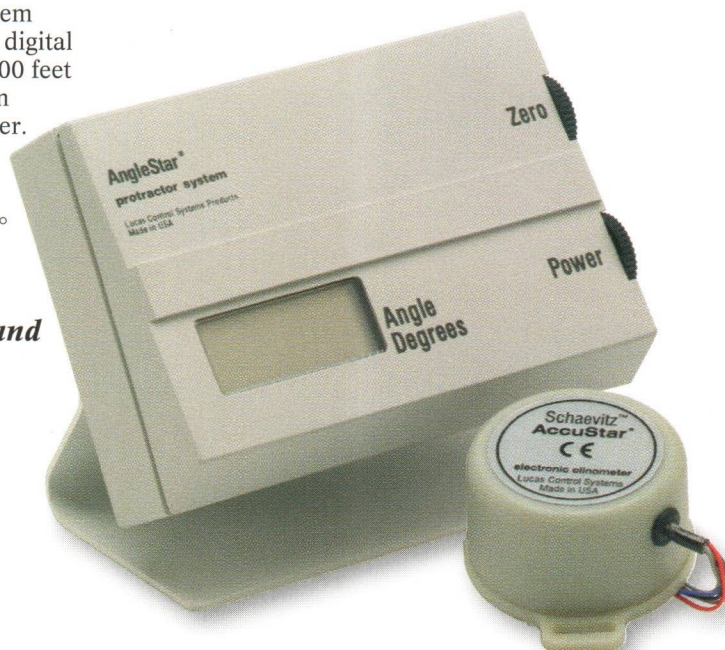
Four Conductor, AWG 26, PVC Jacket

Standard Length 4 feet (≈ 1.2 meters)

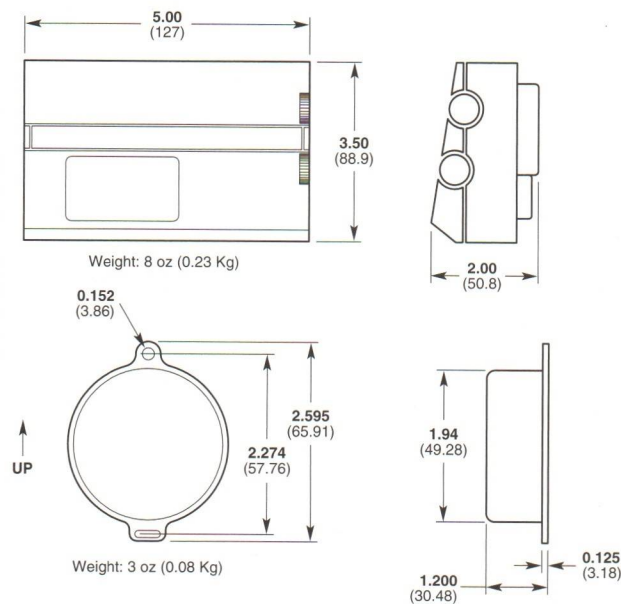
Maximum Length 200 feet (≈ 61.5 meters)

*Linearity specification applies to standard and high resolution systems only.

(Cable lengths up to 200 feet are available. Consult factory for details.)



Dimensions in (mm)



How to Order

| Model Number | Range |
|--------------|-------------------------|
| 02160001-000 | $\pm 45^\circ$ |
| 02160003-000 | $\pm 20^\circ$ |
| 02160005-000 | 0° to 90° |

SCHAEVITZ
SENSORS

AngleStar® Digital Protractor

Model DP-45

The AngleStar® Digital Protractor Model DP-45 provides instant digital display of level, angle and tilt. Consists of a rugged electronic sensor, custom circuitry and liquid crystal display in an easy-to-use, hand held battery powered package. Features include alternate reference and display hold. Digital display eliminates the need to interpret a bubble or vernier scale.

Features

- ❑ Reads in degrees
- ❑ Alternate reference (floating zero)
- ❑ Display hold
- ❑ High impact plastic carrying case

Applications

- ❑ Driveshaft maintenance
- ❑ Antenna positioning
- ❑ Race cars
- ❑ Machine tooling

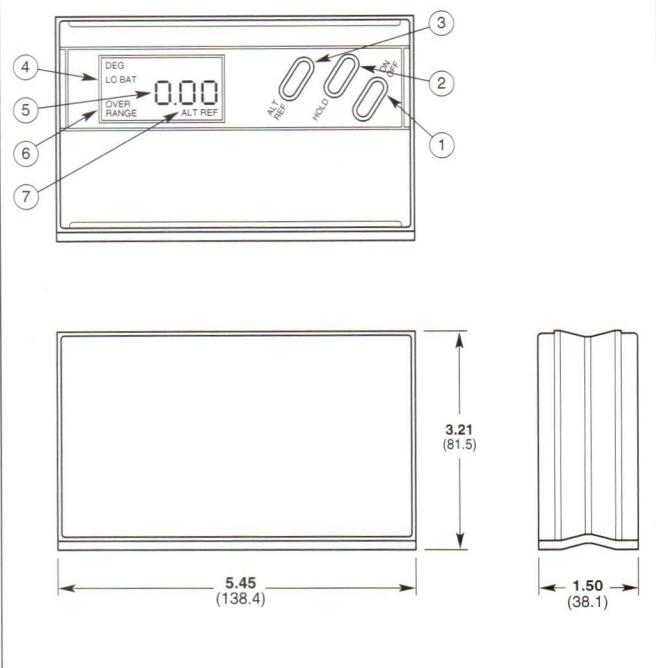


Performance Specifications

| | |
|--------------------------|---|
| Range | ±45° |
| Resolution | ±0.1° |
| Linearity | ±0.1° (0° to 10°) 1.5% of reading (10° to 45°) |
| Repeatability | ±0.1° |
| Cross Axis Error | <1% up to 45° cross axis angle |
| Voltage Supply | 9 volt battery |
| Battery Life | 100 hours approx. |
| Temperature Range | |
| Operating | 0° to 65°C |
| Storage | -40° to 65°C |
| Weight | 12.3 oz (349 gms) |

1. **ON/OFF** The instrument is powered by a single push of the ON/OFF button. Power is removed by a second push of the same button or after a 10 minute time out period.
2. **HOLD** The display reading on the LCD is retained and flashes when the HOLD button is depressed. Push again to release hold feature.
3. **ALT REF** (Floating Zero) Alternate reference allows you to zero the digital readout anywhere within its range for a quick and accurate measurement of deviations from a reference surface.
4. **LO BAT** LO BAT is displayed on the LCD when the battery voltage drops below 7 volts. The battery should be replaced when this condition exits. Low battery voltage may affect accuracy.
5. **MINUS SIGN** The minus sign (-) indicates an angle in the counterclockwise direction from zero. Absence of the minus sign indicates an angle clockwise from zero.
6. **OVER RANGE** When the instrument is used at an angle that exceeds its measurement range ($\pm 55^\circ$ from level, null) no angular reading will appear on the LCD and OVER RANGE will flash.
7. **ALT REF** Depressing the ALT REF button will zero the display reading to a new reference and "ALT REF" will be displayed on the LCD. A second push of the ALT REF will return the instrument to normal, or gravity referenced mode.

Dimensions in (mm)

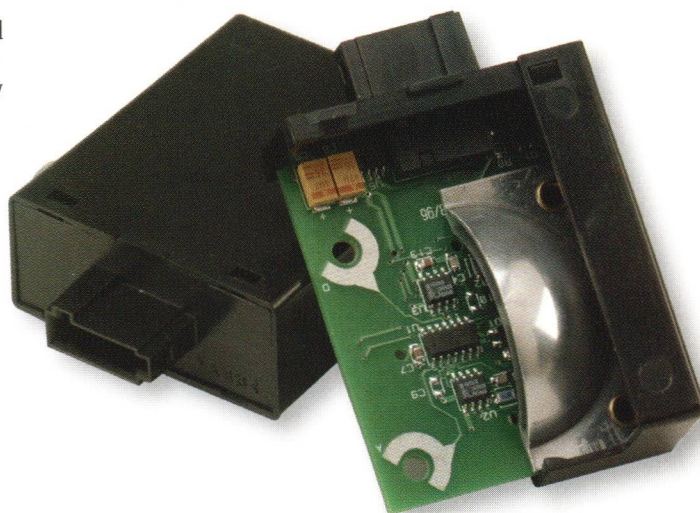


Tilt Car Alarm

New Dome Technology

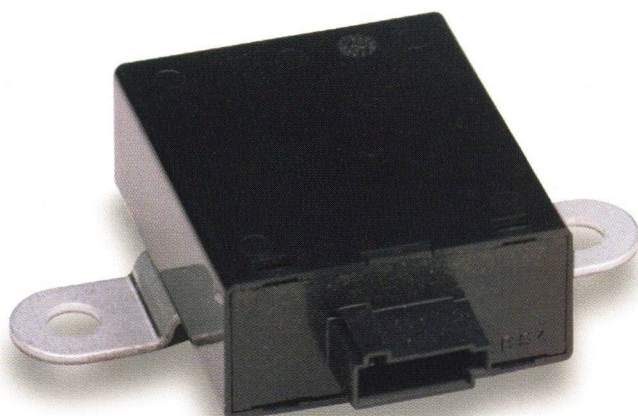
Range: $\pm 20^\circ$

The Tilt Car Alarm from Schaevitz® Sensors is a fully conditioned tilt sensor. It can be programmed to interface with any host car alarm system. This microprocessor based device can be factory programmed to detect angle changes of 0.5° in either the pitch or roll axis of a vehicle or factory programmed with a higher sensitivity to suit the vehicle's suspension systems. This technology is immune to many false alarm parameters such as movement due to passing vehicles and deliberate rocking of the vehicle which effect other sensing technologies. The Tilt Car Alarm has been designed and tested to all applicable automotive electrical and environmental requirements.



Immune to False Alarms due to . . .

- ☐ *Wind*
- ☐ *Passing vehicles*
- ☐ *Passing aircraft*
- ☐ *Deliberate heavy rocking*
- ☐ *Temperature changes $<25^\circ\text{C/hr}$*



Performance Specifications

| | |
|-------------------------------|---|
| Alarm Trigger Range | $\pm 20^\circ$ in two axis |
| Alarm Threshold (min) | $0.5^\circ \pm 0.1^\circ$ $\leq 11.0^\circ$ initial angle |
| (Larger thresholds available) | $0.7^\circ \pm 0.3^\circ$ $> 11.0^\circ$ initial angle |
| | not defined $> 20.0^\circ$ |

Electrical Specifications

| | |
|---------------------------|---------------------|
| Supply Voltage | 9 to 18 VDC |
| Supply Current | |
| No Alarm | 700 μ A nominal |
| Alarm | 2.5 mA |
| Output Options | Open Collector |
| (Other outputs available) | |

Environmental Specifications

| | |
|-------------------------|-----------------------------------|
| Temperature Range | -40 to 85°C |
| Shock | Survival 100g, 11 msec, half sine |
| Humidity | 96% non-condensing |

SCHAEVITZ
SENSORS

NEW! AccuSwitch™

Dual Axis Tilt Switch

Schaevitz® Sensors is proud to introduce the new AccuSwitch™ Dual Axis Tilt Switch based on the highly successful AccuStar® II/DAS-20. The AccuSwitch™ offers programmable switch points for both axes. Open collector and polarity outputs for each axis affords versatility and economy in a single package. Designed to meet the needs of the man lift and material handling markets, it is easily adapted to fit numerous applications.

Performance Specifications

| | |
|------------------------------|-------------------|
| Range | ±2° to ±20° |
| Reset | 50% of set point |
| Threshold / Resolution | 0.01 |
| Repeatability | 0.1° |
| Frequency Response | 0.50 Hz (nominal) |

Environmental

| | |
|---------------------------|--------------|
| Temperature Range | |
| Operating | -20° to 65°C |
| Storage | -55° to 65°C |
| Temperature | |
| Coefficient of Null | 0.01%/°C |
| Temperature Coefficient | |
| of Scale Factor | 0.10%/°C |

Electrical Connections

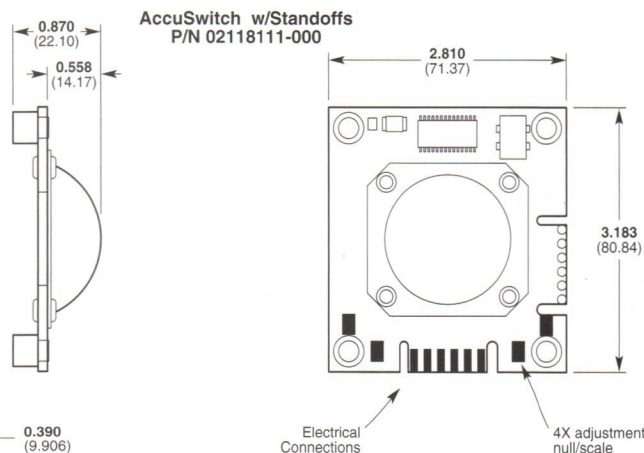
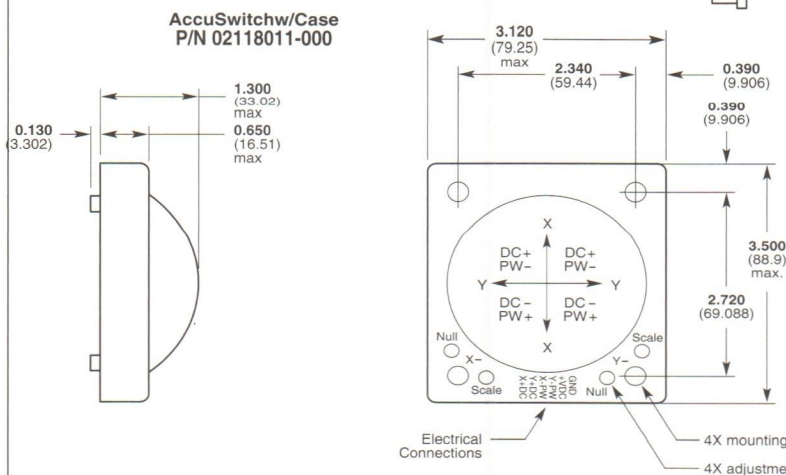
| Wire | Source |
|------------|-----------------------------|
| GND | Ground |
| +VDC | + Power Input |
| Y-PW | Y Axis Open Collector Input |
| X-PW | X Axis Open Collector Input |
| Y-DC | Y Axis Polarity Output |
| X-DC | X Axis Polarity Output |



Electrical

| | |
|------------------------------------|---------------------------|
| Voltage Supply (nominal) | 9 VDC |
| Voltage Supply Range | Regulated 5.0 to 15.0 VDC |
| Current | 10 mA |
| Polarity Outputs (@ 9 VDC input) | |
| V-Logic 1 (+) | 7.25 VDC (typ) |
| V-Logic 0 (-) | 1.95 VDC (typ) |
| Open Collector Inputs | |
| Continuouss Collector Current..... | 1A (max) |
| Collector - Ground Voltage..... | +25 VDC (max) |

Dimensions in (mm)



How to Order

| Part Number | Description |
|--------------|------------------------|
| 02118011-000 | AccuSwitch w/case |
| 02118111-000 | AccuSwitch w/standoffs |
| 09-01-1061A | Mating Molex connector |

Note: Connector is recommended for model 02118011-000 (AccuSwitch w/case).

Pressure Sensors and Transducers



Pressure Sensors



Schaevitz® Pressure Sensor Technology

Functional Advantages and Design Considerations



Schaevitz® pressure sensors integrate the latest sensing technologies with proven design and engineering techniques. Utilizing silicon piezoresistive, foil strain gauge and Linear Variable Differential Transformer (LVDT) technologies, the Schaevitz® diversified family of pressure measurement products meets a wide variety of application requirements.

Our pressure transducers perform in demanding environments such as power plants, water treatment facilities, aircraft and marine hydraulic systems, nuclear testing, flight-qualified systems, and a number of energy management and climate control systems.

A broad offering of standard pressure products enables us to satisfy most pressure sensing needs. Many Schaevitz® pressure products are available with selected options that provide custom features within the cost parameters of standard catalog products. We also have the engineering expertise to develop special sensor configurations for volume applications.

All Schaevitz® pressure sensors are covered by a one year warranty. The quality inherent in Schaevitz® pressure instruments is derived from time proven designs, carefully chosen materials for construction, state-of-the-art assembly techniques, and computer controlled testing methods. Our facilities in England, China and the USA are ISO 9001 approved.

What is the operating pressure range or required overrange for the application?

As well as taking into account the normal working pressure of the sensor, you should review the maximum possible overrange to which a sensor is likely to be subjected in your application. In addition, the type of pressure measurement may affect the sensor life. For instance, continual pressure cycling of high pressure may cause fatigue and decrease the life cycle. Contact an application engineer for assistance with special applications.

Note that pressure spikes several times higher than the system pressure may occur in fluid systems. If a fluid flow is abruptly stopped, a pressure spike will occur.

Schaevitz® Sensors cover pressure ranges from 0.07 psi to 10,000 psi (5 mbar to 700 bar) full range. High overload protection has become a very important factor in sensor performance. Schaevitz® strain gauge sensors, with a built in positive overload stop, take 500% overload as standard. In high fatigue areas, special units are offered to withstand hostile environments.

What pressure reference is required?

- ☐ Vented Gauge (V)
The measurement is referenced to the atmospheric pressure. Zero is set at atmospheric pressure.
- ☐ Sealed Gauge (S)
The measurement is referenced to a sealed internal reference pressure. Zero is set at atmospheric pressure.
- ☐ Absolute Pressure (A)
Measurement is referenced to an internally sealed vacuum. Zero is usually set at absolute zero (vacuum).
- ☐ Differential Pressure (D)
Measurement is the difference between two unknown pressures. Measurement can be unidirectional where the pressure of one port is always higher than the pressure on the other port or bidirectional where the higher pressure may change from port to port. In differentials, consideration should also be given to media being measured, i.e., is it dry or wet.

What are the pressure interface requirements?

Schaevitz® pressure sensors are available with a large selection of pressure ports for various applications. Refer to individual product pages for pressure port selection.

What are the electrical interface requirements?

Schaevitz® pressure sensors are available with a large selection of amplifiers for various applications as well as unamplified units with millivolt output. Pressure sensors with Intrinsic Safety Approval, BASEFA, are available on select models.

What is the pressure media and operating environment?

You must determine the suitability of a transducer for liquids or gases and its ability to withstand corrosion. Also, consideration must be given to areas like vibration, shock, etc.

Schaevitz® standard transducers are made using 316L, 17-4 pH, 17-7 pH stainless steel and can withstand most dry gases and pressure media such as lubrication oil, hydraulic oil, harsh chemicals, etc. Where the media is known to be corrosive, such as subsea environments, chemical processes, and some food processes, Schaevitz® sensors can be manufactured from Hastelloy® C276 or Inconel 625.

What is the operating temperature range?

There are two factors when determining operating temperature range of the pressure sensor: what is the media temperature and to what temperature is the complete sensor exposed? If the media temperature is excessively high, this may be reduced by fitting a standoff pipe between the media and the sensor. Temperature compensation of Schaevitz® sensors is normally up to a maximum of 185°F (85°C) and operating temperature range from -40°F to 250°F (-40°C to 120°C).

Thermal considerations

Thermal errors can easily grow and exceed other parameters. Schaevitz® has spent considerable engineering efforts to minimize these errors. Our higher end products are market leaders.

Our strain gauge units are compensated down to $\pm 0.015\%/^{\circ}\text{C}$ without digital compensation. Our P9000 Series has a thermal error as small as $\pm 0.004\%/^{\circ}\text{C}$. Please note that these values are Zero and Span combined. Some competitors specify the error separately for span and zero in which case the error is twice as large.

Piezoresistive silicon gages do not have the same linear thermal error as foil strain gauge transducers. We are therefore compensating them differently. Our PS10,000, TITAN, PS3300 and Ares Series have a digital compensation that corrects the thermal error at many temperature points within the compensated temperature range. Thermal errors for our silicon based products are as low as 0.2% (typ) for our PS10,000 and 0.8% (typ) for our Titan and PS3300. This is the maximum error over the full temperature range from -15°F to 185°F (-25°C to 85°C).

Pressure Units Conversion Chart

| | Atmosphere | psi | Bar | in H ₂ O | mm Hg | Pascal |
|--------------------|-----------------------|-----------------------|-----------|-----------------------|----------------------|--------|
| 1 atmosphere | 1 | 14.70 | 1.013 | 406.8 | 760 | 10130 |
| psi | 0.068 | 1 | 0.069 | 27.68 | 51.72 | 6890 |
| 1 bar | 0.987 | 14.5 | 1 | 401.5 | 750 | 10000 |
| 1 inch water (4°C) | 0.0025 | 0.036 | 0.0025 | 1 | 1.87 | 249.1 |
| 1 mm Hg (0°C) | 0.0013 | 0.019 | 0.0013 | 0.535 | 1 | 133.3 |
| 1 Pascal | 9.87×10^{-6} | 1.45×10^{-4} | 10^{-5} | 4.02×10^{-3} | 7.5×10^{-3} | 1 |

Schaevitz® Pressure Sensor Technology

Selection Overview

Schaevitz® pressure transducers have been designed for use in typical transducer environments. However, some applications will require a very specialized or nonstandard transducer. In these applications the flexibility inherent in Schaevitz® transducers allows for complicated parameters to be easily met. Many of the specials which have been manufactured are available for use by any customer. The exact part number for a special transducer is supplied by our factory.

Silicon-Based Transducers

PS3300 Series

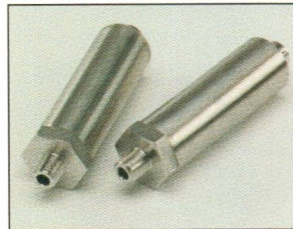


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The PS3300 is a low cost, high reliability OEM pressure transducer featuring an ASIC (application specific integrated circuit) and silicon sensor in a rugged stainless steel package that meets IP65 and NEMA 4 specifications.

- Unique modular design using "smart" signal conditioning electronics
- Available from 15 psi FS to 6000 psi FS (1 to 400 Bar)
- High interchangeability
- Standard and custom options available in OEM quantities

PS10,000 Series



Page 170

The strong history of industrial packaging capabilities from Schaevitz® coupled with the latest in silicon sensing technologies results in the innovative PS10,000 industrial pressure transducer.

- 0.05% accuracy typical (0.1% max)
- 5 psi to 10,000 psi pressure range F.S.
- Rugged stainless steel all welded construction
- NEMA 4X (IP65) media isolated
- High interchangeability
- Advanced digital compensation
- Frequency response 1000 Hz -3dB
- CE certified

Differential Pressure

P2100 Series



Page 174

These transducers are designed for differential pressure measurement of wet/wet media. The P2100 Series offers full range outputs from 10 psi D to 2500 psi D. They are ideally suited for highly corrosive fluids, but also have applications where size and weight are at a premium.

LVDT-Based for Low Pressure

P3000 Series



Page 178

The P3000 Series are rugged and reliable devices for the measurement of low pressures, either vented gauge or wet/dry differential pressures, in a variety of fluid media.

Foil Strain Gauge

P200 Series



Page 180

The P200 Series are lower cost, compact package size, general purpose sensors.

- Available in pressure ranges from 100 to 10,000 psi (7 to 700 bar)

P900 Series



Page 182

P900 Series premium grade sensors provide highly precise measurement of absolute, vented gauge, or sealed gauge pressures over wide temperature ranges.

- All-welded construction provides high reliability and stability
- Senses small changes of applied pressure
- Range of electrical inputs and outputs

Foil Strain Gauge

P1200 Series

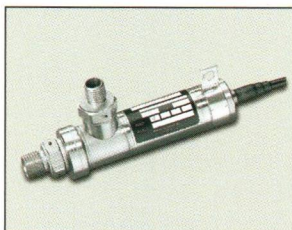


Page 186

The P1200 Series provide high accuracy pressure measurement of liquids and gases.

- Available in pressure ranges from 100 to 10,000 psi (7 to 700 bar)

P1400 Series

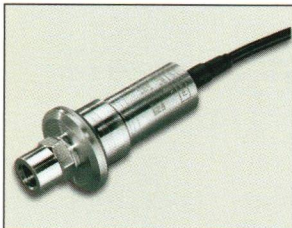


Page 188

The P1400 Series provide highly precise measurement of wet/dry differential pressures over wide temperature ranges.

- Available in pressure ranges from 7 to 1,000 psi (1 to 35 bar)

P1500 Series

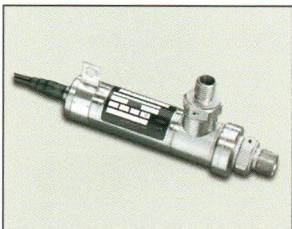


Page 192

The P1500 Series provide high performance, precise measurement of absolute or vented gauge pressures over wide temperature ranges.

- Available in pressure ranges from 0-1.5 to 5 psi (0-100 to 350 mbar)

P1600 Series



Page 196

The P1400 Series provide highly precise measurement of wet/dry differential pressures over wide temperature ranges.

- Available in pressure ranges from 0-1.5 to 5 psi (0-100 to 350 mbar)

P9000 Series



Page 200

The P9000 Series unique design utilizes the proven reliability of strain gauge technology and innovative digital compensation electronics.

- Available in pressure ranges from 75 psi to 10,000 psi (5 bar to 700 bar)

Foil Strain Gauge

TITAN Series

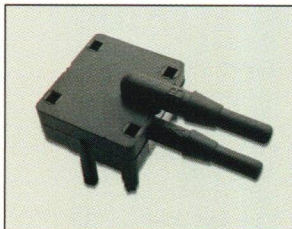


Page 204

TITAN Series are high accuracy OEM pressure transducers. With all wetted parts made of 316L stainless steel it can measure most media. TITAN guarantees high interchangeability.

- Available from 15 to 6,000 psi (1 to 400 bar)
- Accuracy of 0.025%

Ares Sensors



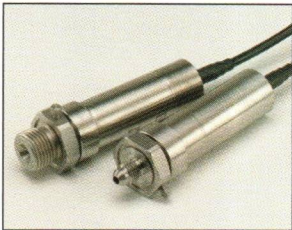
Page 208

The Ares Series are differential and gauge pressure transducers suitable for low pressures of dry non-corrosive/conductive media. The transducer is based on our strong capability to combine piezoresistive sensors with rugged electronics in small packages.

- Very low pressure ranges
- Small size
- PCB mountable

Specialized Applications

Steel Mill P981 Series



Page 211

These media isolated pressure transducers are designed specifically for harsh environments found in steel and aluminum rolling mill applications.

Subsea Pressure Sensors



Page 213

Schaevitz® Sensors has a long term field-proven record for specialized pressure sensors designed for the off-shore oil and gas drilling industry.

PS3300 OEM Series

Low Cost, High Reliability Silicon Pressure Transducer

The PS3300 OEM Series is a low cost, high reliability advanced silicon pressure transducer. The PS3300 features a Schaevitz® developed ASIC (Application Specific Integrated Circuit) and silicon sensor in a rugged stainless steel package that meets IP65 and NEMA 4 specifications. All wetted parts are made of 316L stainless steel welded together.

The PS3300 has high frequency response and resolution while at the same time the ASIC compensates for temperature and linearity errors. The EE-prom is programmed by a sophisticated compact, computer controlled pressure and temperature calibration system. Zero and Span is factory set within 0.1% (0.25% max) for high interchangeability. The durable PS3300 is designed to meet the European requirements for EMI and RFI for heavy industrial use. CE certification is to be obtained by the OEM customer for the final product media. Operating temperature is from -40°F to 255°F (-40°C to 125°C).

The PS3300 is ideal for the following applications: hydraulics, pneumatics, robotics, refrigeration compressors, water level, waste water, fire control and train braking to mention a few.



Features

- ❑ ***All stainless steel, 316L, wetted parts for maximum corrosion resistance***
- ❑ ***Proprietary custom ASIC providing both error correction and signal amplification***
- ❑ ***Stainless steel housing, IP65, NEMA 4 protection***
- ❑ ***Available in ranges to 6000 psi FS (400 bar)***
- ❑ ***Outputs available: 0.5 - 4.5VDC; 4-20 mA; 0 - 5 VDC***
- ❑ ***Operating media temperature range from -40°F to 255°F (-40°C to 125°C)***
- ❑ ***Compensated temperature range from -13°F to 185°F (-25°C to 85°C)***
- ❑ ***High interchangeability***
- ❑ ***Standard and custom options available in OEM quantities***
- ❑ ***Test reports available as option***

Specifications By Model

| Model Numbers | PS3333 | PS3363 | PS3383 |
|---|--------------------------------|----------------------------------|----------------------------------|
| Output @ 77°F (25°C) F.R.O. | 0.5 - 4.5 VDC (ratiometric) | 0 to 5 VDC ±0.1% Typ. (0.25%) | 4 to 20mA ±0.15% Typ. (0.25%) |
| Input Voltage (VDC) | 5± 0.25, 4 mA (no load) | 10 to 32, 5 mA (no load) | 10 to 30 |
| Output Impedance (Ohms) | 5 | 10 | 1 Meg |
| Output Current Limit (mA) Typ. | 27 | 27 | 30 |
| Zero Offset (% F.R.O.) | ±0.1% Typ. (0.25%) | ±0.1% Typ. (0.25%) | ±0.1% Typ. (0.25%) |
| Combined Thermal Zero & Sensitivity Error (%F.R.O.)* | ±1% (1.5%) | ±1% (1.5%) | ±1% (1.5%) |

Figures in () indicate maximum values.

*-25°C to 85°C. Other ranges available in OEM quantities

Common Specifications (All specifications are at 77°F (25°C) unless otherwise noted)

Pressure Ranges¹

Absolute (psia) psi: 0 to 15, 30, 100, 250

bar: 0 to 1, 1.6, 2, 2.5, 4, 6, 7, 10, 15, 16, 25

Vented Gauge (psig) psi: 0 to 15, 30, 100, 250

bar: 0 to 1, 1.6, 2, 2.5, 4, 6, 7, 10, 15, 16, 25

Sealed Gauge (psis) psi: 0 to 500, 1000, 3000, 5000, 6000

bar: 0 to 35, 40, 60, 70, 100, 205, 250, 350, 400

Pressure References Absolute, vented gauge², and sealed gauge

Pressure Limit 0 to 100 psi (0 to 7 bar) ≥5X the rated pressure
250 to 1,000 psi (15 to 70 bar) ≥3X the rated pressure
3,000 psi (205 bar) ≥ 2.5X the rated pressure

Burst Pressure 0 to 250 psi (0 to 15 bar) ≥10X the rated pressure
500 to 6,000 psi (35 to 205 bar) ≥10,000 psi

Media Liquids or gases compatible with 316L stainless steel.

Static Error Band

Combined Nonlinearity, Hysteresis,
and Nonrepeatability ±0.25% F.R.O. BSL max.

Temperature Ranges

Compensated -13° to 185°F (-25° to 85°C)

Operating Media -40° to 255°F (-40° to 125°C)

Operating Electronic Unit -40° to 212°F (-40° to 100°C)

Storage -58° to 212°F (-50° to 100°C)

Humidity 95% R.H., noncondensing on all vented gauge units and 100% R.H. condensing on absolute and sealed gauge units.

Vibration 20g Mil-Std-810C, Procedure 514.2, Figure 514.2-2, Curve L.

Shock 50g, 11 msec half sine shock per mil standard 202F, method 213B, condition A

Insulation Resistance 500 Mohms @ 100 VDC per Mil-Std 202F, Method 302, condition A.

Long Term Drift ≤0.1% F.R.O./Year Typ.

Frequency Response 1000 Hz (-3dB) except model PS3383 which is 100 Hz

EMC (by design) Emissions to EN55022 (CISPR 22).

Radiated immunity to EN61000-4-3 Level 3 10V/m 27-1000 MHz.

Burst Transients to EN61000-4-4, Severity Level 3.

Electrostatic Discharge to EN61000-4-2, Severity Level 2, 4kV contact, 8kW air discharge.

Conducted Susceptibility ENV50141, 10V/m.

¹For MPA Ranges, multiply bar ranges by 0.1

²Vented gauge units should only breathe dry, non-corrosive gases, and must breathe through the receptacle- mating connector must have a vent hole. Cable version will vent through the vent tube.

PS3300 OEM Series

Low Cost, High Reliability Silicon Pressure Transducer

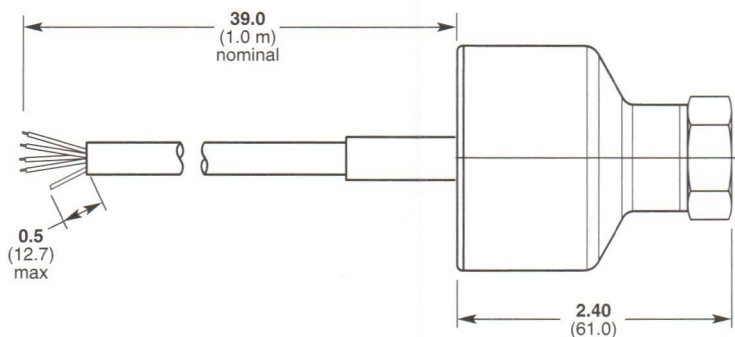
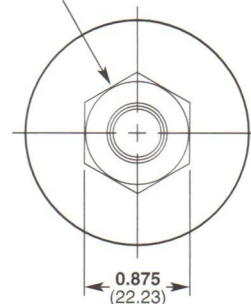
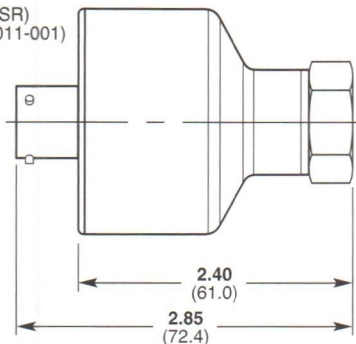
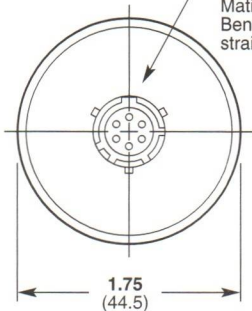
Dimensions

in (mm)

Bendix PT02A-10-6P
receptacle, shell size 10

Mating connector:
Bendix PTO6A-10-6S (SR)
straight plug (pn 62101011-001)

7/16-20 UNF-2B
SAE-4 straight thd
O-ring port

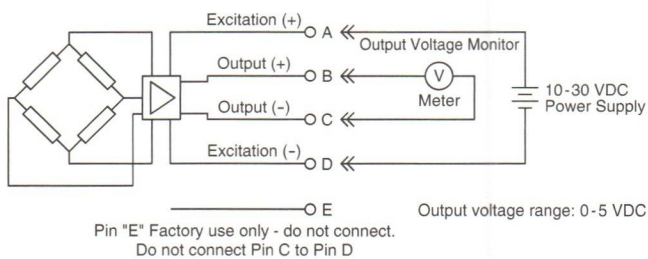


Electrical Interface

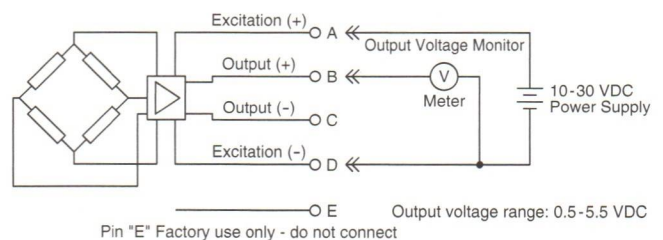
| Signal | Connector Version Pin Designator | Cable Version Wire Color |
|----------------|-------------------------------------|-----------------------------|
| Excitation (+) | A | Red |
| Output (+) | B | Green |
| Output (-) | C | White |
| Excitation (-) | D | Black |
| Do Not Connect | E | N/A |

Wiring

PS3363 Voltage Output - 4 wire

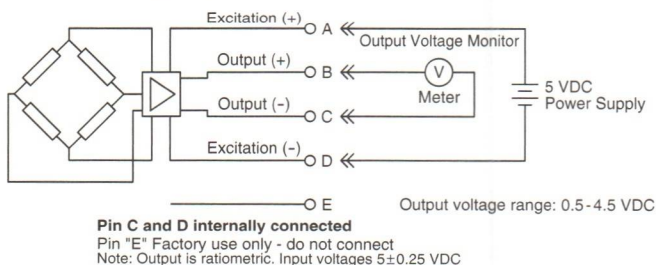


PS3363 Voltage Output - 3 wire (optional)

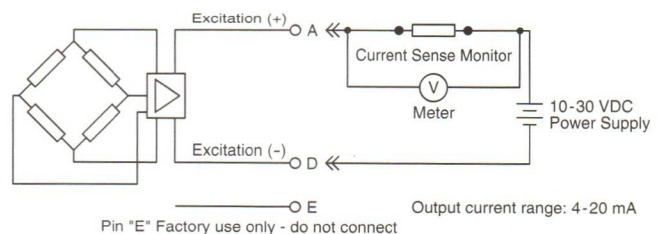


Note: 3-wire connection requires factory calibration in 3-wire mode to maintain accuracy. CMV noise performance may be degraded in 3-wire mode. Output Pin C (-) is not connected in this configuration. Warning: Damage will occur if Pin C (-) is connected.

PS3333 Voltage Output - 4 wire



PS3383 4-20 mA Output



How to Order

Specify by input/output, cable/connector, pressure port, pressure range, and unit of measure.

Cable/Connector Model Number Code: PS33 3 — 000 —

Input/Output

3— 0.5 to 4.5 Volt output (5 VDC supply)
6— 0 to 5 V output (10-30 VDC supply)
8— 4 to 20 mA output (10-30 VDC supply)

Pressure Port

2 — 1/4 in BSP male**
4 — 7/16 in 20 UNF male**
5 — 1/4 in 18 NPT male**
7 — 7/16 inch 20 UNF female
SAE-4 O-ring boss
(MS16142-4)

Unit

P: psi
B: bar

Cable/Connector*

1 — Cable output
3 — Connector output

Pressure Reference

A: Absolute
S: Sealed gauge
V: Vented gauge

Mating Connectors: PT06A-10-6S (SR)
Sold Separately General Applications (stock item)

Pressure Range***
(Enter full scale pressure range without units)

| | |
|-----|---|
| Psi | 0 to 15; 30; 100; 250; 500; 1000; 3000, 5000, 6000 |
| Bar | 0 to 1; 1.6; 2; 2.5; 4; 6; 7; 10; 15; 16; 25; 35; 40; 60; 70; 100; 205; 250; 350; 400 |

* Special connector with Pin F removed is used for vented gauge with PN 62101011-001. Other configurations available in OEM quantities.

** Screw in adapters

*** Additional pressure ranges available upon request, contact factory.

Note: 15 to 250 psi (1 to 25 bar) available in absolute and vented gauge only. 500 to 6,000 psi (35 to 400 bar) available in sealed gauge only.

PS10,000 Series

Digitally Compensated Pressure Transducer

The PS10,000 pressure transducers combines the strong history of industrial packaging capabilities from Schaevitz® with the latest in silicon sensing technologies.

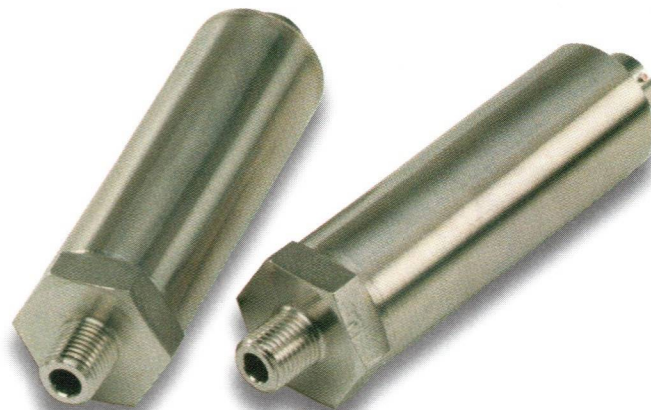
A unique modular design enables the new PS10,000 series pressure transducers to serve numerous markets. The PS10,000 offers exceptional price/performance and gives OEM accuracy found only in high performance units costing hundreds of dollar more.

At the heart of the PS10,000 transducer is an advanced silicon micromachined piezoresistive sensing element. This element is packaged in a rugged 316L stainless steel media isolated housing, and calibrated to provide a foundation for the PS10,000 finished transducer. The addition of a digital compensation module provides complete signal conditioning, offering 4-wire 0-5 VDC and 0-10 VDC outputs, or a 2-wire 4-20 mA loop output. Superb accuracy is achieved through advanced digital compensation and automated test calibration techniques thus providing a nonlinearity error of typically less than 0.05% F.R.O. ($\pm 0.1\%$ F.R.O. low ranges), with an aggressive compensated temperature range of 13°F to 185°F (-25°C to 85°C).

The unique signal conditioner inside each PS10,000 compensates for both non-linearity and thermal error. Every PS10,000 media isolated transducer is subjected to 100% pressure and temperature testing to determine its individual characteristics before burn-in of the digital circuits. To enable a frequency response of 1000 Hz (-3dB), Schaevitz® has designed a unique circuit with a "through-path" architecture providing high speed while still allowing the PS10,000 to set the zero and span within tolerances of $\pm 0.1\%$.

Features include a static error band as small as 0.05% FS (Non-linearity, Hysteresis and Nonrepeatability), and pressure ranges from 0-5 to 10,000 psi (0-.35 to 700 Bar). Special pressure ranges and pressure ports are available upon request.

The PS10,000 offers an economical solution to applications where high accuracy is required but not previously affordable. The PS10,000 provides a high degree of interchangeability and easy installation in demanding environments such as process plants, water treatment facilities, hydraulic systems and earth-moving equipment.



Features

- ☐ **IP65, NEMA 4X**
- ☐ **5 psi to 10,000 psi pressure range F.S.**
- ☐ **0.05% typical static error band (0.1% max.)**
- ☐ **Wide temperature range: 13°F to 185°F (-25°C to 85°C)**
- ☐ **Rugged stainless steel all welded construction**
- ☐ **High interchangeability: unit for unit**
- ☐ **Advanced digital compensation**
- ☐ **1000 Hz frequency response (-3 dB)**
- ☐ **NEMA 4X (IP65) media isolated**
- ☐ **CE certified**

Applications

- ☐ **Hydraulic and pneumatic controls**
- ☐ **Process industries**
- ☐ **Refrigeration**
- ☐ **Research and test facilities**

PS10,000 models, when correctly installed, are CE certified to comply with the EMC Directive 89/336/EEC Generic Standards for Residential, Commercial, Light Industrial and Industrial Environments.



PS10,000 Series

Pressure Ranges: 0-5 to 0-10,000 psi
(0-0.35 to 0-700 bar)

Accuracy: $\leq \pm 0.05\%$ F.R.O.

Specifications By Model

| Model Numbers | PS10,061/3 | PS10,071/3 | PS10,081/3 |
|---|--|--|---|
| Output @ 25°C (77° F) F.R.O. | 5 VDC $\pm 0.1\%$ typ ($\pm 0.25\%$ max) | 10 VDC $\pm 0.1\%$ typ ($\pm 0.25\%$ max) | 4 to 20 mA $\pm 0.1\%$ typ ($\pm 0.25\%$ max) |
| Input Voltage (VDC) | 10 to 32 | 13 to 32 | 10 to 32 |
| Output Impedance (Ohms) | < 10 | < 10 | 1 Meg |
| Output Current Limit (mA) max | 50 | 50 | 30 |
| Zero Offset (% F.R.O.) | 0 Volts $\pm 0.1\%$ typ ($\pm 0.25\%$ max) | 0 Volts $\pm 0.1\%$ typ ($\pm 0.25\%$ max) | 0 Volts $\pm 0.1\%$ typ ($\pm 0.25\%$ max) |
| Combined Thermal Zero & Sensitivity Error (%F.R.O.*) | $\pm 0.2\%$ typ, $\pm 0.5\%$ max | $\pm 0.2\%$ typ, $\pm 0.5\%$ max | $\pm 0.2\%$ typ, $\pm 0.5\%$ max |
| Weight gm (oz) | | | |
| Cable Version | 180 (6.4) | 180 (6.4) | 180 (6.4) |
| Connector Version | 165 (5.9) | 165 (5.9) | 165 (5.9) |

Typical figures valid for approximately 90% of production (range dependent).

*-25°C to 85°C

Common Specifications (All specifications are at 77°F (25°C) unless otherwise noted)

Pressure Ranges

| | | |
|---------------------------|--|--|
| Absolute (psia) | psi: 0 to 15, 30, 50, 100, 250 | bar: 0 to 1, 1.6, 2, 2.5, 4, 6, 7, 10, 15, 16, 25 |
| Vented Gauge (psig) | psi: 0 to 5, 15, 30, 50, 100, 250 | bar: 0 to 0.35, 1, 1.6, 2, 2.5, 4, 6, 7, 10, 15, 16, 25 |
| Sealed Gauge (psis) | psi: 0 to 500, 1000, 2500, 5000, 10000 | bar: 0 to 0.35, 1, 40, 60, 70, 100, 175, 205, 250, 350, 400, 700 |

Pressure References Absolute, vented gauge, and sealed gauge (Vented gauge units should only breathe dry, non-corrosive gases, and must breathe through the receptacle – mating connector must have a vent hole)

Pressure Limit 0 to 100 psi (0 to 7 bar) $\geq 5X$ the rated pressure
250 to 2,500 psi (17 to 175 bar) $\geq 3X$ the rated pressure
5000 to 10,000 psi (350 to 700 bar) $\geq 1.5X$ the rated pressure

Burst Pressure 0 to 250 psi (0 to 17 bar) $\geq 10X$ the rated pressure
500 to 2,500 psi (35 to 175 bar) $\geq 4X$ the rated pressure
5000 to 10,000 psi (350 to 700 bar) $\geq 2X$ the rated pressure

Pressure Media Liquids or gases compatible with 316L stainless steel

Static Error Band

Combined Nonlinearity, Hysteresis, and Nonrepeatability $\pm 0.05\%$ F.R.O. typical accuracy, $\pm 0.1\%$ F.R.O. maximum

Temperature Ranges

Compensated -13° to 185°F (-25° to 85°C)
Operating -40° to 212°F (-40° to 100°C)
Storage -58° to 212°F (-50° to 100°C)

Humidity 95% R.H., noncondensing on all vented gauge units and 100% R.H. condensing on absolute and sealed gauge units.

Vibration $\pm 20g$ MIL-STD-810C, Procedure 514.2, Figure 514.2-2, Curve L

Shock 50g, 11 msec half sine shock per mil standard 202F, method 213B, condition A

Insulation Resistance 10 Mohm @ 100 VDC

Long Term Drift $< 0.1\%$ F.R.O./Year Max

Frequency Response 1000 Hz (-3dB)

EMC Emissions to EN55022 (CISPR 22) Limit B.

Radiated immunity to IEC-801-3 Level 3 10V/m (ENV 50140).

Burst Transients to IEF 801-4 Level 3 (2kV) (EN61000-4-4).

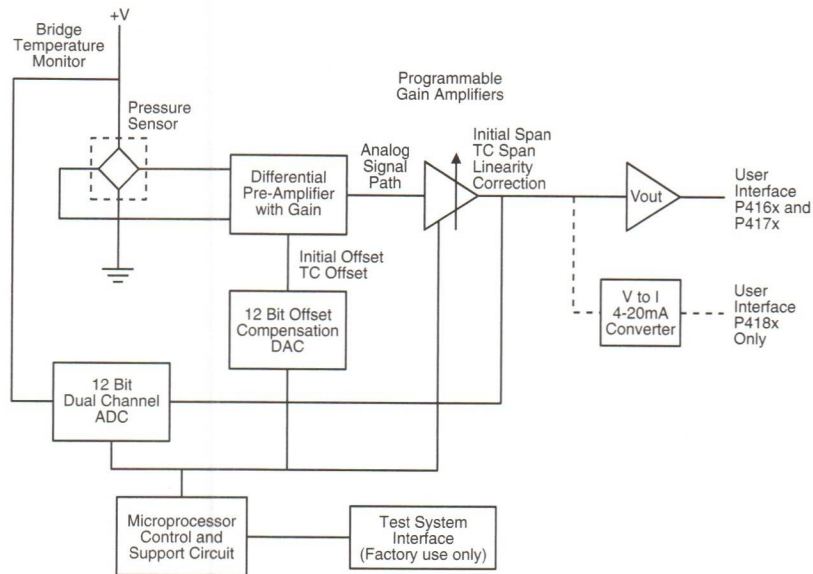
Electrostatic Discharge to IEC 801-2 Level 2 (4kV) (EN61000-1-2, 8kW air).

Conducted RF to Mil Std 461D, CS114 Level 2.

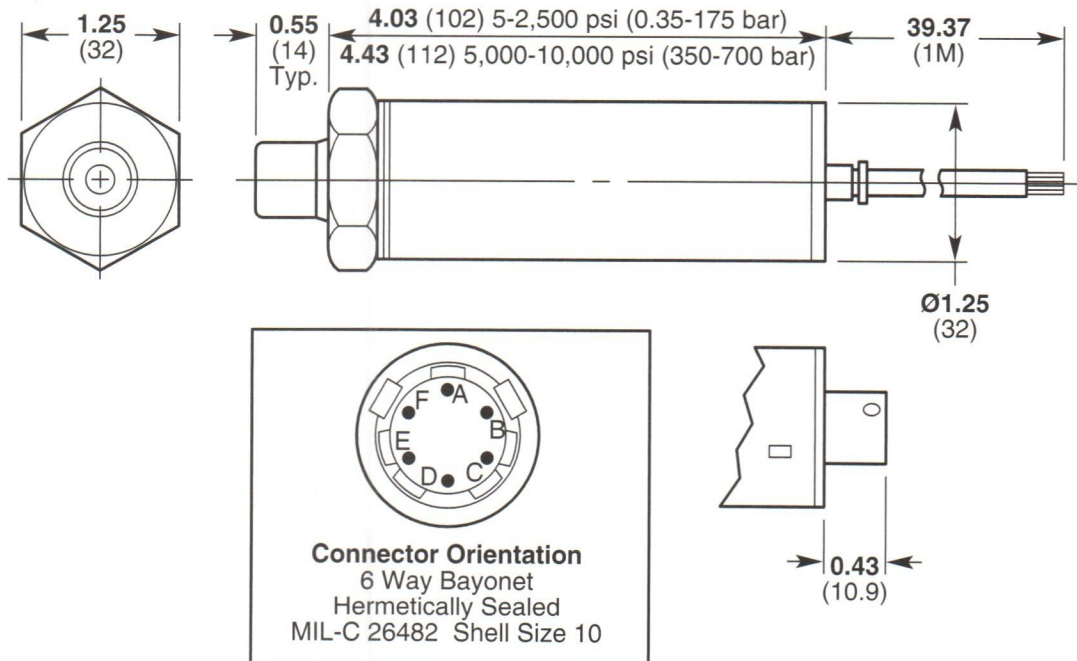
SCHAEVITZ
SENSORS

PS10,000 Series

Digitally Compensated Pressure Transducer



Dimensions in (mm)

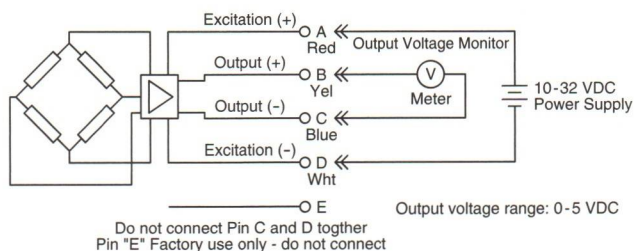


Cable Version: 39 inches (1 meter), 6 core, 28 gauge polyurethane with integral vent tube.

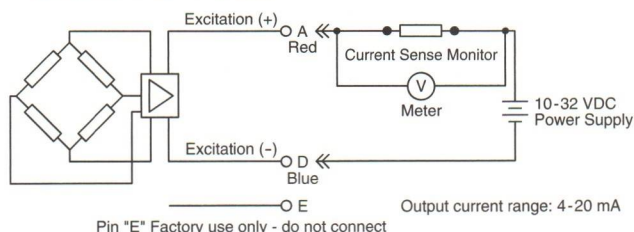
Vented Gauge units must breathe dry, non-corrosive gases. Connector version is vented through the removed pin "F". Cable versions are vented through a vent tube inside the cable sleeve.

Wiring

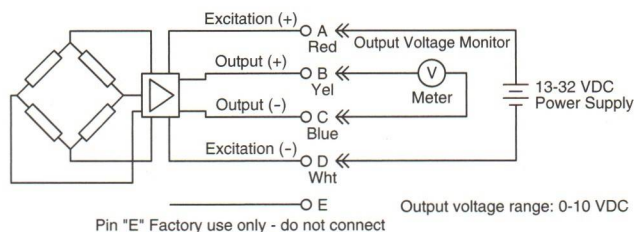
PS10061/3 Voltage Output - 4 wire



PS10081/3 4-20 mA Output



PS10071/3 Voltage Output - 4 wire



How to Order

Specify by input/output, cable/connector, pressure port, pressure range, and unit of measure.

Cable/Connector Model Number Code: PS10, 0

Input/Output

- 6 - 0 to 5 V output (10-32 VDC supply)
- 7 - 0 to 10 V output (13-32 VDC supply)
- 8 - 4 to 20 mA output (10-32 VDC supply)

Cable/Connector

- 1 - Cable output
- 3 - Connector output

Mating Connectors: PT06A-10-6S (SR)

Sold Separately General Applications (stock item)

Pressure Port

- 2 - 1/4 in BSP male
- 4 - 7/16 in 20 UNF male
- 5 - 1/4 in 18 NPT male

Pressure Reference

- A: Absolute
- S: Sealed gauge
- V: Vented gauge

Pressure Range

(Enter full scale pressure range without units)

- psi 0 to 5; 15; 30; 50; 100; 250; 500; 1000; 2500; 5000; 10,000
- bar 0 to 0.35; 1; 1.6; 2; 2.5; 4; 6; 7; 10; 15; 16; 25; 35; 40; 60; 70; 100; 175; 205; 250; 350; 400; 700

Reference Pressures:

- 0 to 5 psi (0.35 bar) available in Vented Gauge only.
- 0 to 15 to 250 psi (1 to 25 bar) available in Absolute and Vented Gauge only.
- 0 to 500 to 10,000 psi (35 to 700 bar) available in Sealed Gauge only.

P2100 Series

Differential Pressure Transducer

The P2100 series of transducers is designed for differential pressure measurement of wet and/or corrosive fluids. There is a range of models with full range pressure from 10 psi D to 3,500 psi D. Common line pressures up to 5000 psi can be accommodated with minimal effect on the output and each port is equipped with overpressure protection (up to 5 times range on P1). A selection of electrical outputs is available from 20 mV to 4-20 mA two wire the latter having the option of BASEEFA approval.

The P21X1 to P21X4 series is designed for use with fluids which can deposit some form of residue within a cavity and therefore the pressure ports can be removed for cleaning.

The P21X6 to P21X9 series is an all welded construction with the wetted ports made from Hasteloy C-276. This instrument is designed to handle highly corrosive fluids but also has applications where size and weight are at a premium.

Features

- ☐ **Differential measurement of corrosive fluids**
- ☐ **Bi-directional differential pressure (calibrated option)**
- ☐ **High overload protection in either direction**
- ☐ **Low and high level output**
- ☐ **Removable pressure ports**
- ☐ **2 wire 4-20 mA option BASEEFA and CENELEC approval class EEx ia IIc T4 ($T_{amb}=60^{\circ}\text{C}$)**



Environmental (all models)

Temperature Compensated

Range 32°F to 185°F (0°C to 85°C)

Operating Temperature Range

High Range -22°F to 248°F (-30 to 120°C)

Medium Range -5°F to 212°F (-20 to 100°C)

Storage Temperature -22°F to 266°F (-30 to 130°C)

Humidity

Cable Outlet Immersible to 100 ft (30.5 m)

Connector Outlet 95% relative humidity

Mechanical Natural Frequency

High Range Approx. 4 kHz for 75 psi (5.0 bar) up to 15 kHz for 1000 psi (70 bar)

Medium Range Approx. 2 kHz for 10 psi (0.7 bar) up to 3.0 kHz for 25 psi (1.7 bar)

Steady Acceleration

and Linear Vibration $\leq 0.5\%$ F.R.O./g for 10 psi (0.7 bar) decreasing to less than 0.02% F.R.O./g for 500 psi (35 bar) and above.

Frequency range 0-2 kHz at 20g max. limited to 8mm double amplitude

Shock 1000g for 5 milliseconds in any axis will not damage the sensor.

Altitude -150 feet to +70,000 feet without damage

Insulation Resistance 500 Megohms at 50 VDC @ 25°C

P2100 SeriesPressure Ranges: 0-10 to 3500 psi
(0-0.7 to 250 bar)Accuracy: $\pm 0.35\%$ F.R.O.**Specifications by Model @ 77°F (25°C)**

| Model Number | P2101/9 | P2141/9 | P2151/9 | P2161/9 | P2181/9 | P2191/9 |
|---|--|---|-----------------------|-----------------------|-----------------------------|---------------------|
| Input Voltage | 10 VDC (12 V max) | 10 VDC (12 V max) | 11-18 VDC | 18-36 VDC | 10-36 VDC | ± 15 VDC |
| Resistance | 350 ohm $\pm 5\%$ | | | | | |
| Current | 30 mA | 30 mA | 30 mA | 35 mA | — | +30/-2 mA |
| Output | | | | | | |
| Unidirectional | | | | | | |
| 0-0.7 bar | 20mV to 25mV | 0-2.5V $\pm 2\%$ | 0-2.5V $\pm 2\%$ | 0-2.5V $\pm 2\%$ | 16 mA $\pm 2\%$ | — |
| 0-1 bar & above | 25mV $\pm 2\%$ | 0-2.5V $\pm 2\%$ | 0-2.5V $\pm 2\%$ | 0-2.5V $\pm 2\%$ | (4-20 mA) $\pm 2\%$ | 0-5V $\pm 2\%$ |
| Bidirectional | | | | | | |
| ± 0.7 bar | ± 10 mV min. | ± 2.5 V $\pm 2\%$ | ± 2.5 V $\pm 2\%$ | ± 2.5 V $\pm 2\%$ | 4-20 mA $\pm 2\%$ | — |
| ± 1 bar & above | ± 12.5 mV $\pm 2\%$ | ± 2.5 V $\pm 2\%$ | ± 2.5 V $\pm 2\%$ | ± 2.5 V $\pm 2\%$ | (16 mA) $\pm 2\%$ | ± 5 V $\pm 2\%$ |
| Resistance (ohm) | 350 $\pm 5\%$ | <10 | <10 | <10 | — | <10 |
| Current mA (max) | 10 mA | 5 mA | 5 mA | 5 mA | — | 5 mA |
| Load Resistance | | | | | 0 at 10V to 1300 ohm at 36V | |
| Residual Unbalance(FRO) | $\pm 2\%$ | $\pm 2\%$ | $\pm 2\%$ | $\pm 2\%$ | $\pm 2\%$ | $\pm 2\%$ |
| Accuracy: Combined Non-Linearity Hysteresis and Non-Repeatability | | $\pm 0.35\%$ FRO (BSL) Each port separately on BD option | | | | |
| Thermal Zero Shift | $\leq \pm 0.015\%$ FRO/ $^{\circ}$ C | $\leq \pm 0.02\%$ FRO/ $^{\circ}$ C | | | | |
| | $\leq \pm 0.015\%$ FRO/ $^{\circ}$ C of total BD output on BD option | $\leq \pm 0.02\%$ FRO/ $^{\circ}$ C of total BD output on BD option | | | | |
| Thermal Sensitivity Shift | $\leq \pm 0.015\%$ FRO/ $^{\circ}$ C | $\leq \pm 0.02\%$ FRO/ $^{\circ}$ C | | | | |
| | $\leq \pm 0.15\%$ FRO/ $^{\circ}$ C of total BD output on BD option | $\leq \pm 0.02\%$ FRO/ $^{\circ}$ C of total BD output on BD option | | | | |
| Weight oz (gm) | | | | | | |
| P21X1/4 | 35.7 (1000) | 35.7 (1000) | 35.7 (1000) | 35.7 (1000) | 35.7 (1000) | 35.7 (1000) |
| P21X6/9 | 18.9 (530) | 18.9 (530) | 18.9 (530) | 18.9 (530) | 18.9 (530) | 18.9 (530) |

Common Specifications

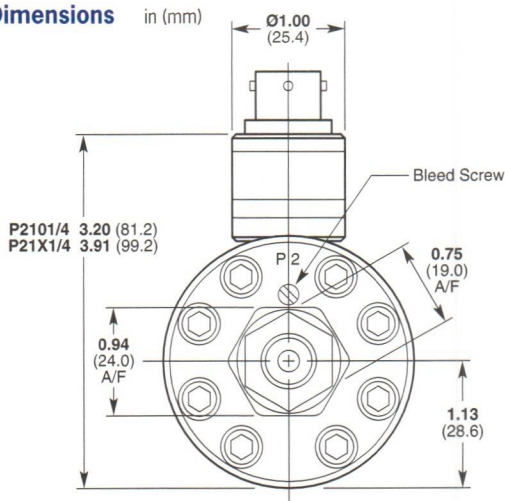
| | P21X1/4 | P21X6/9 |
|--|---|---|
| Pressure Ranges | | |
| Medium | 10; 15; 25; 35 | 10; 15; 25; 35 |
| High Range | 0.7; 1.0; 1.5; 2.5 | 0.7; 1.0; 1.5; 2.5 |
| psi | 75; 100; 150; 250; 500; 1000; 2000; 3500 | 75; 100; 150; 250; 500; 1000 |
| bar | 5; 7; 10; 20; 35; 70; 150; 250 | 5; 7; 10; 20; 35; 70 |
| Line Pressure | 3500 psi (250) bar max. standard | 1500 psi |
| | 5000 psi (350 bar) option | (100 bar) max. |
| Zero Shift with Line Pressure | $\pm 1.0\%$ per 1000 psi (70 bar) Nominal Individual calibration given. BD options nominally $\pm 1\%$ of combined BD output. | |
| Differential Pressure Limit | | |
| P1 | 5x rated pressure or 3750 psi (260 bar) whichever is less | 5x rated pressure or 1500 psi (100 bar) whichever is less |
| P2 | 2 x rated pressure or 3750 psi (260 bar) whichever is less | 2 x rated pressure or 1500 psi (100 bar) whichever is less |
| Differential Burst Pressure | | |
| P1 | ≥ 10 x rated pressure or 5000 psi (350 bar) whichever is less | 10 x rated pressure or 2500 psi (170 bar) whichever is less |
| P2 | ≥ 6 x rated pressure or 4000 psi (275 bar) whichever is less | |
| Pressure Media | Liquids or gases compatible with AIS1300, 17-4 & 17-7 SS and Nitrile "O" rings | Liquid or gases compatible with Inconel 625 and Hastelloy C-276 |
| Sensitivity Imbalance | P2 = P1 $\pm 2.5\%$ ($\pm 1\%$ per 1000 psi) (70 bar) Full Range Pressure | |
| Zero Shift with Alternating Full Fange Pressure Cycling (BD) | $\pm 0.25\%$ FRO on P1 ($\pm 0.5\%$ FRO on P2) | |
| Shunt Calibration (not P218x) | 80% $\pm 5\%$ full range pressure | |

**CHAEVITZ
SENSORS**

P2100 Series

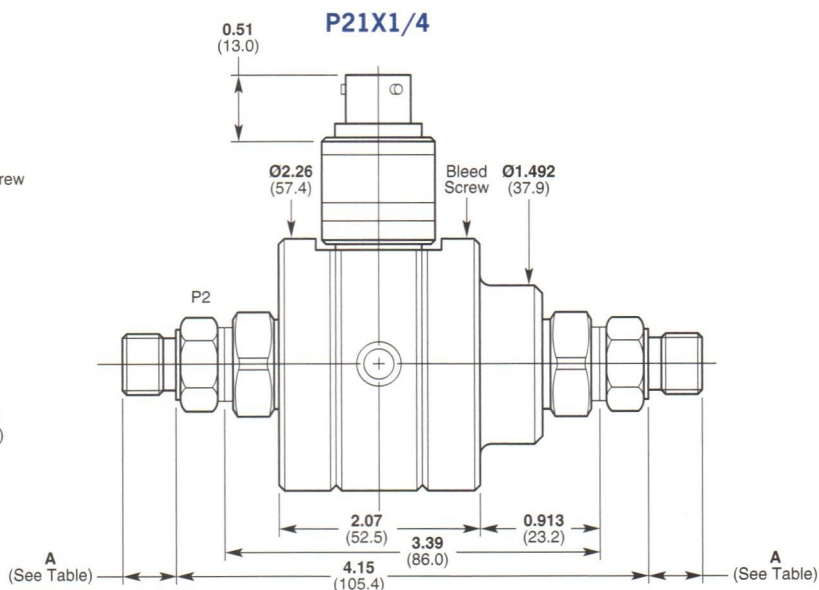
Differential Pressure Transducer Type

Dimensions in (mm)



P21X1/4 Adapters

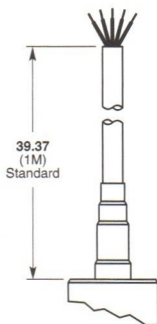
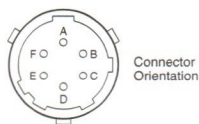
| Thread Size | Code | A in (mm) |
|--------------------|------|--------------|
| 1/4" (BSP) (F) | 0001 | 0.46 (11.9) |
| 1/4" (BSP) (M) | 0002 | 0.45 (11.7) |
| M14 x 1.5 (M) | 0003 | 0.40 (10.2) |
| 7/16"-20UNF-2A (M) | 0004 | 0.55 (14.2) |
| 1/4"-18NPT (M) | 0005 | 0.55 (14.2) |
| M10 x 1.0 (F) | 0006 | 0.38 (9.9) |
| 1/4"-18NPT (F) | 0007 | 0.56 (14.4) |



P21X6/9

P21X6/9 Adapters

| Thread Size | Code | A in (mm) |
|--------------------|------|--------------|
| 1/4" (BSP) (F) | 0001 | 0.46 (11.9) |
| 1/4" (BSP) (M) | 0002 | 0.47 (11.7) |
| M14 x 1.5 (M) | 0003 | 0.55 (14.2) |
| 7/16"-20UNF-2A (M) | 0004 | 0.54 (14.0) |



Connections

| Cable | Connector ² |
|---------------------|-----------------------------------|
| Red ¹ | Pin A ¹ Excitation (+) |
| White | Pin D Excitation (-) |
| Yellow | Pin B Output (+) |
| Blue ^{1,2} | Pin C ^{1,2} Output (-) |
| Violet | Pin E } 80% shunt calibration |
| Grey | Pin F } |

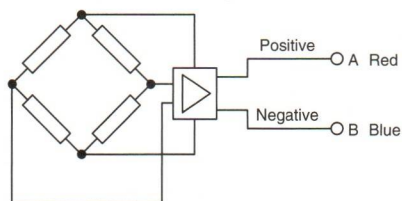
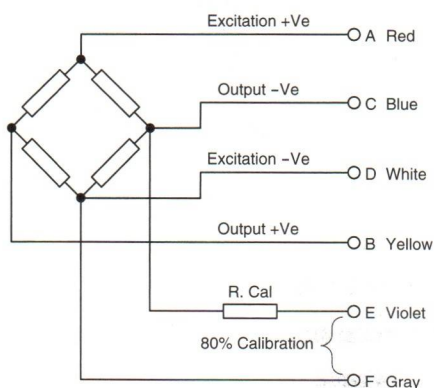
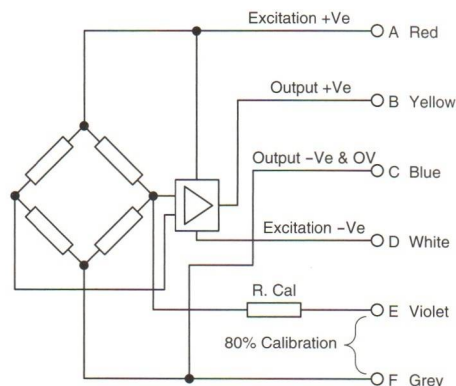
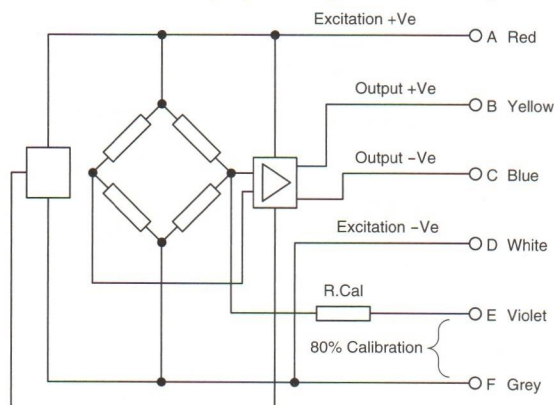
¹ 2-wire transmitter connections

² 0 Volt P219X, P218X series

P2100 Series

Pressure Ranges: 0-10 to 3500 psi

(0-0.7 to 250 bar)

Accuracy: $\pm 0.35\%$ F.R.O.**Wiring****P2181/9****P2101/9****P2191/9****P2141/9, P2151/9 and P2161/9****Designation and Ordering Information**

Specify by transducer Type number, coding, pressure range and UD or BD (UD = Unidirectional, BD = Bidirectional)

Example: P2101-0022, 0-10 bar UD signifies "Pressure transducer, cable outlet and 1/4 BSP male screw in pressure adapter, with metal/nitrile rubber bonded seal, ranged 0-10 bar UD with 0-25mV output from 10 VDC supply."

Type No. & Code P21

0 – 25mV output
 4 – 2.5V output (10V supply)
 5 – 2.5V output (11-18V supply)
 6 – 2.5V output (18-32V supply)
 8 – 4-20 mA output (10-36V supply)
 9 – 5V output (+15.0-15V supply)

Intrinsic Safety

0 – Non IS
 9 – IS (P2180 only)

0 – Welded
 adaptor
 2 – Screw in
 adaptor

Unit

B: bar
 P: psi

Pressure Reference

UD: uni-directional
 BD: bi-directional

1 – High range – cable outlet
 2 – Medium range – cable outlet
 3 – High range – connector outlet
 4 – Medium range – connector outlet
 6 – High range – cable outlet with Inconel wetted parts
 7 – Medium range – cable outlet with Inconel wetted parts
 8 – High range – connector outlet with Inconel wetted parts
 9 – Medium range – connector outlet with Inconel wetted parts

1 1/4 BSP female
 2 1/4 BSP male
 3 14 x 1.5 male*
 4 7/16 in-20 UNF 2A male*
 5 1/4 in-18 NPT male*
 6 10 x 1 mm Arsero*
 Ermeto female
 9 1/4 in 18 NPT female*
 *Inconel only to special order

Pressure Range

(Enter full scale pressure range without units)

High (bar) 0-5; 7; 10; 20;
 35; 70; 150; 250
 (psi) 0-75; 100; 150;
 250; 500; 1000;
 2000; 3500
 Medium (bar) 0.7; 1.0; 1.5; 2.5
 (psi) 0-10; 15; 25; 35

SCHAEVITZ
SENSORS

P3000 Series

LVDT-Based for Very Low Pressure Measurement from 2" of H₂O

The P3000 Series pressure sensors are rugged and reliable devices for the measurement of low pressures, either vented gauge or wet/wet differential pressures, in a variety of fluid media.

The pressure sensing element of this sensor includes an all-welded Ni-Span C capsule that offers low hysteresis and constant scale factor with temperature variation. The deflection of the capsule when pressurized is measured by an LVDT displacement sensor whose core is directly coupled to the capsule. The LVDT produces an electrical output that is directly proportional to core motion, which is, in turn, proportional to the pressure applied to the capsule.

Features

- ❑ *Zero and span potentiometers*
- ❑ *Low operating current*
- ❑ *Unregulated input*
- ❑ *High line pressure; low differential*
- ❑ *Vented gauge or wet/wet differential*

Applications

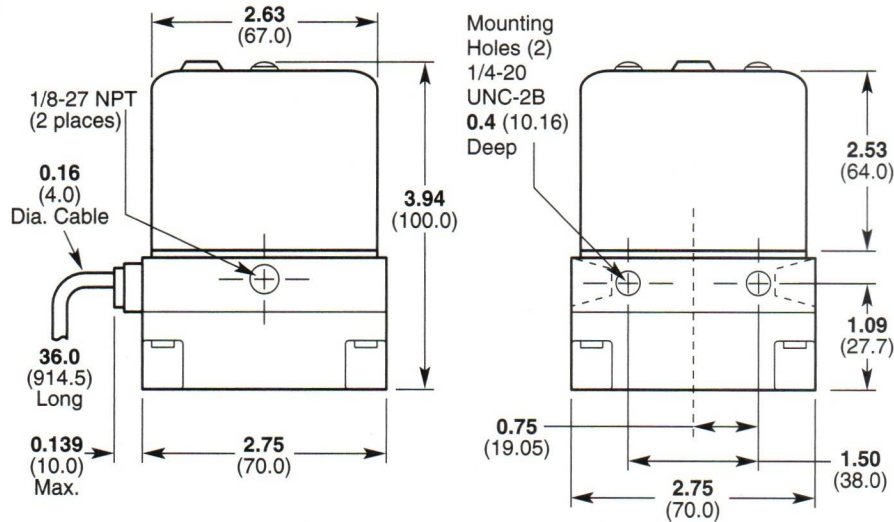
- ❑ *Liquid levels in bulk storage tanks and closed pressure vessels*
- ❑ *Climate control and energy management*
- ❑ *Air/fuel ratio measurement in industrial furnaces*
- ❑ *Leakage measurement in natural gas meters*



Specifications by Model

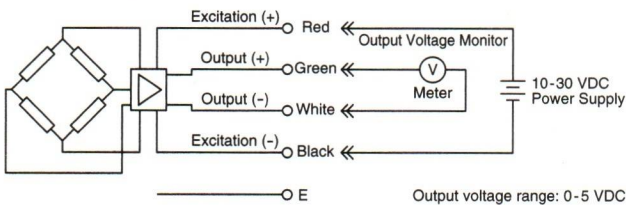
| Model Number | P3061 | P3081 |
|---|--|--------------------------------|
| Input Supply Voltage (unregulated) | 10-32 VDC | See loop supply |
| Current (mA) | 1.2 | — |
| Loop Supply | — | 10-32 VDC |
| Loop Resistance (ohms) | — | 1200 (max) |
| Zero Adjustment Range (%F.R.O.) | ±10 | ±10 |
| Span Adjustment Range (%F.R.O.) | ±10 | ±10 |
| Output (Uni-directional output standard) | 0-5 VDC 5 mA (max) | 4-20 mA 2-wire loop |
| Output Impedance | 1 ohm | — |
| Frequency Response | 1 Hz | 1 Hz |
| Output Change with Input Voltage Change | <0.1% from 10 to 32 VDC | — |
| Combined Nonlinearity, Hysteresis, and Nonrepeatability | <±0.5% F.R.O. | <±0.5% F.R.O. |
| Combined Thermal Zero and Sensitivity Shift | | |
| % F.R.O./°F | 0.035 | 0.035 |
| % F.R.O./°C | 0.02 | 0.02 |
| Temperature Range | | |
| Operable | -40°F to 175°F (-40°C to 80°C) | -40°F to 175°F (-40°C to 80°C) |
| Compensated | 25°F to 150°F (-5°C to 65°C) | 25°F to 150°F (-5°C to 65°C) |
| Wetted Materials | | |
| Port P ₁ | -A380 aluminum, Ni-Span C, Buna-N "O" rings, 300 Series SS | |
| Port P ₂ | -A380 aluminum, Ni-Span C, Buna-N "O" rings, 300 Series SS, 52% Ni/48% | |
| Fe alloy | | |
| Weight oz (Kg) | 16 (0.45) | 16 (0.45) |

Dimensions in (mm)

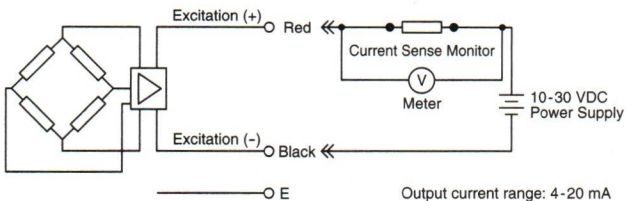


Wiring

P3061 Voltage Output - 4 wire



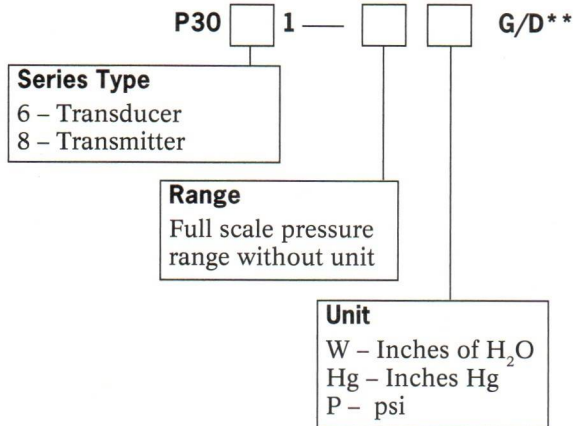
P3081 4-20 mA Output - 2 wire Current Loop



How to Order

Specify by series type, range, pressure units, and reference mode. Example: P3061-100 WD designates a 10-32 VDC input, 0 to 5 VDC output differential pressure transducer with a full scale pressure input of 100 inches of water.

Model Number and Code



Pressure Ranges and Ratings

| Pressure Ranges | Metric Equivalent | Pressure Reference* | Overpressure (P ₁ >P ₂) | Overpressure (P ₂ >P ₁) | Line Pressure (max) |
|---------------------------|-------------------|---------------------|--|--|---------------------|
| 0-2 In H ₂ O | 0-5 mbar | G/D | 5psi | 3 psi | 200 psi |
| 0-5 In H ₂ O | 0-12.5 mbar | G/D | 5 psi | 3 psi | 200 psi |
| 0-10 In H ₂ O | 0-25 mbar | G/D | 5 psi | 3 psi | 200 psi |
| 0-20 In H ₂ O | 0-50 mbar | G/D | 8 psi | 5 psi | 200 psi |
| 0-50 In H ₂ O | 0-125 mbar | G/D | 15 psi | 10 psi | 200 psi |
| 0-100 In H ₂ O | 0-250 mbar | G/D | 37 psi | 25 psi | 200 psi |
| 0-200 In H ₂ O | 0-500 mbar | G/D | 37 psi | 25 psi | 200 psi |
| 0-15 psi | 0-1 bar | G/D | 75 psi | 50 psi | 200 psi |
| 0-50 psi | 0-3.5 bar | G/D | 150 psi | 100 psi | 200 psi |
| 0-100 psi | 0-7 bar | G | 150 psi | 100 psi | 200 psi |

*G = vented gauge; D = differential

Other ranges available

**Note: All transducers in gauge mode are supplied with a filter plug in P2 port. For differential pressure measurements, remove plug. All units are calibrated in gauge mode (unidirectional differential).

P200 OEM Series

Pressure Transducer

The P200 Series offers all the features which Schaevitz® pressure sensors are renowned for at a lower cost and in a smaller package.

The versatile, compactly designed sensor achieves high performance, and is available with various connection options.

For those unusual applications, the P200 range can be customized to suit your particular requirements.

A general purpose transducer using strain gauge technology, the P200 is appropriate for a variety of applications. Used for specialist prototype work on engine test beds, the P200 Series is able to monitor the level of pressure on a variety of engine features including engine oil measurement, induction pressures and exhaust pressures. The P200 is also suitable for prototype equipment testing such as for the development of braking systems for all forms of transport. In general industrial machine controls, the P200 is used for all applications that require the monitoring of hydraulics and pneumatic devices.



Features

- ❑ **High performance, lower cost**
- ❑ **Cable/connector termination**
- ❑ **CE Marked, ISO 9001 Approved Manufacturer**
- ❑ **Compact design, all-welded construction**

Applications

- ❑ **Vehicle brake systems**
- ❑ **Hydraulic control systems**
- ❑ **Motorsport applications**
- ❑ **General pressure**

Common Specifications

Pressure Ranges

(psi) 100; 150; 200; 250; 350; 500; 750; 1000; 1500; 2200; 3500; 5000; 7500; 10,000

(bar) 7; 10; 15; 25; 35; 50; 70; 100; 150; 200; 250; 350; 500; 700

Pressure References Vented gauge¹

Pressure Limit ≥ 2.5 x full range pressure or 12,000 psi (830 bar), whichever is less. Will not cause a zero offset exceeding 0.04% F.R.O. (recoverable within a few hours)

Burst Pressure ≥ 10 x full range pressure or 22,000 psi (1,500 bar), whichever is less

Pressure Media Liquids or gases compatible with 17-4 pH and 17-7 pH stainless steel

Combined Nonlinearity, Hysteresis

and Nonrepeatability $\leq \pm 0.15\%$ F.R.O. (BSL) typical; $\leq \pm 0.20\%$ max

Temperature Range

Media -65°F to 212°F (-54°C to 100°C)

Operable -40°F to 185°F (-40°C to 85°C)

Compensated -4°F to 176°F (-20°C to 80°C)

Thermal Zero Shift $\leq \pm 0.020\%$ F.R.O./°C

Thermal Sensitivity Shift $\leq \pm 0.020\%$ F.R.O./°C

Shock Resistance 100 g for 6 msec will not damage the sensor

Vibration Resistance Surpasses MIL STD810C Method 514-2 Curve L and EUROCAE ED 14A/RTCA 160A

Humidity

Connector Version 95% Relative humidity

Cable Version Immersible to IP67, 1 meter (fluid must not enter end of cable)

CE Marked EMI/RFI tested to 20 v/m

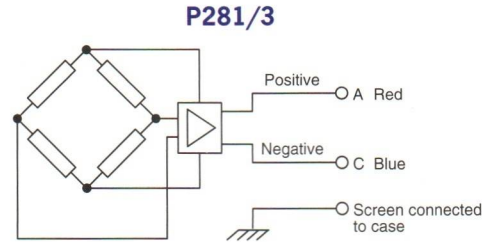
Insulation Resistance 500 Mohm at 50 VDC @ 25°C

¹ Vented gauge units must only be used in dry, noncorrosive environments and will breathe through the cable vent tube or hole in the 6-way receptacle.

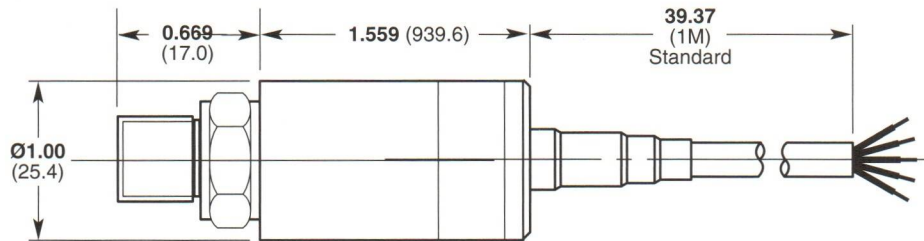
Specifications by Model All specifications are at 77° F (25°C) unless otherwise noted

| | |
|------------------------------------|-------------------------|
| Series | P200 |
| Model Number | P281/3 |
| Input Voltage | 10-36 VDC |
| Full Range Output (±2%) | 4-20 mA (16 mA±2%) |
| Load Resistance | 1300 ohms at 36 VDC max |
| Residual Unbalance % F.R.O. | +2-0% |
| Frequency Response | 100 Hz |
| Weight oz (gm) | |
| Connector Version | 5.1 (145) |
| Cable Version | 6.3 (180) |

Wiring



Dimensions in (mm)



Model Number Code P2 — 00

Input/Output
8 – 4-20 mA output (10-36 V supply)

Adaptor
0 – Welded

Unit
B: bar
P: psi

Cable/Connector
(Please reference to selected pressure range)
1 – High Range – cable outlet
3 – High Range – connector outlet

Pressure Port
1 – 1/4 in BSP female
2 – 1/4 in BSP male
3 – M14 x 1.5 male
4 – 7/16 in 20 UNF 2A male
5 – 1/4 in 18 NPT male
6 – 10 x 1 mm Arsero
Ermeto female
9 – 1/4 in 18 NPT -2A
female

Pressure Reference
V: vented gauge

Pressure Range
(Enter full scale pressure range without units)
High (psi) 100; 150; 200; 250;
350; 500; 750; 1000;
1500; 2200; 3500;
5000; 7500; 10,000
(bar) 7; 10; 15; 25; 35; 50;
70; 150; 200; 250;
350; 500; 700

How to Order

Specify by transducer excitation, electrical interface, pressure port, pressure range, units, and pressure reference. Example: P281-0005-10V signifies a pressure transducer with 4-20 mA output operating from 10-36 V, cable outlet, welded adaptor, and 1/4 inch-18 NPT male pressure port, ranged 0 to 10 bar vented gauge pressure reference.

P900 Series

Premium Performance Strain Gauge

Schaevitz® P900 Series Strain Gauge Pressure Transducers are premium grade sensors that provide highly precise measurement of absolute, vented gauge, or sealed gauge pressures over wide temperature ranges.

Standard versions of this transducer use a 17-4 pH stainless steel diaphragm to sense pressure (Inconel versions are available for operation in highly corrosive environments). The deflection of the diaphragm is transferred to a double cantilever beam by a force transfer rod. Strain in the beam, and therefore, input pressure is measured by four foil strain gauges.

An all-welded construction provides high reliability and stability. Capable of sensing extremely small changes of applied pressure, the transducers are relatively insensitive to vibration, attitude, and shock.

The P900 Series Pressure Sensors are available in a range of electrical inputs and outputs. Zero and span potentiometers are available as a special option with the P940, P950, P960, and P990 models. Non-standard pressure ranges are available in all models of the P900 Series.

Features

- ❑ **High overload capability**
- ❑ **Operation in high temperatures**
- ❑ **Shock and vibration resistant**
- ❑ **2-wire, 4-20 mA option: Intrinsic safety approval to E Exia IIC T4 ($T_{amb}=60^{\circ}\text{C}$) BASEEFA, CENELEC EN50-020**

Applications

- ❑ **Hydraulic pressure monitoring**
- ❑ **Torpedo depth sensing**
- ❑ **Vehicle brake system monitoring**
- ❑ **Military and commercial aircraft**



Specifications by Model All specifications are at 77° F (25°C) unless otherwise noted

| Series | P900 | P940 | P950 | P960 | P980 | P990 |
|--|--|-----------|-----------|-----------|-------------------------------------|-----------|
| Model Number | P901/904 | P941/4 | P951/4 | P961/4 | P981/4 | P991/4 |
| Input Voltage | 10 VDC (12 V max) | 10 VDC | 11-18 VDC | 18-32 VDC | 10-36 VDC | ±15 VDC |
| Current (mA) | 13 | 20 | 20 | 20 | — | 20 |
| Output at 25°C (F.R.O.) | 900 | 940 | 950 | 960 | 980 | 990 |
| Full Range Output (±1%) | 20 mV | 5 VDC | 2.5 VDC | 5 VDC | 4-20 mA | 5 VDC |
| Impedance (ohms) | 1000 ±5% | <10 | <10 | <10 | Load resist. 1300 max. at 36 VDC | <10 |
| Current (mA max) | — | 5 | 5 | 5 | — | 5 |
| Frequency Response | Approx. 2.5 kHz to 40 kHz for .7 bar | 1 kHz | 1 kHz | 1 kHz | 100 Hz | 1 kHz |
| Combined Thermal Zero & Sensitivity Shift | | | | | | |
| % F.R.O./°F | ±0.008 | ±0.008 | ±0.008 | ±0.008 | ±0.008 | ±0.008 |
| % F.R.O./°C | ±0.015 | ±0.015 | ±0.015 | ±0.015 | ±0.015 | ±0.015 |
| Residual Unbalance | | | | | | |
| % F.R.O. | ±1 | ±1 | ±1 | ±1 | ±1 | ±1 |
| Weight oz (gm) | | | | | | |
| Connector Version | 4.4 (125) | 5.1 (145) | 5.1 (145) | 5.1 (145) | 5.1 (145) | 5.1 (145) |
| Cable Version | 5.6 (160) | 6.3 (180) | 6.3 (180) | 6.3 (180) | 6.3 (180) | 6.3 (180) |



Common Specifications

Pressure Ranges

| | | |
|---------------|--------------------|---|
| High | (psi) | 0-75; 100; 150; 200; 250; 350; 500; 750; 1000; 1500; 2200; 3500; 5000; 7500; 10,000 |
| | (bar) | 0-5; 7; 10; 15; 25; 35; 50; 70; 100; 150; 200; 250; 350; 500; 700; |
| Medium | (psi) | 0-10; 15; 20; 25; 35 |
| | (bar) | 0-0.7; 1.0; 1.5; 1.7; 2.5 |

Pressure References

| | |
|---------------------------------|--|
| High Pressure Range | Vented gauge ¹ : 0-75 to 0-350 psi Absolute and sealed gauge: 0-75 to 0-10,000 psi |
| Medium Pressure Range .. | Vented gauge ¹ and absolute: 0-10; 15; 20; 25; 35 psi (0-0.7; 1.0; 1.5; 1.7; 2.5 bar) |

Pressure Limit $\geq 5x$ full range pressure or 12,000 psi (830 bar), whichever is less. Will not cause a zero offset exceeding 0.04% FRO (recoverable within a few hours)

Burst Pressure $\geq 20x$ full range pressure or 22,000 psi (1,520 bar), whichever is less

Pressure Media Liquids or gases compatible with 17-4 pH and 17-7 pH stainless steel or Inconel 625

Shunt Calibration 80% $\pm 5\%$ full range pressure (not fitted in P980 Series)

Combined Nonlinearity, Hysteresis

and Nonrepeatability High Range: $< \pm 0.10\%$ F.R.O. (BSL); Medium Range: $< \pm 0.20\%$ F.R.O. (BSL)

Temperature Range

Operable -65°F to 250°F (-54°C to 120°C)

Compensated 32°F to 212°F (0°C to 100°C)

Storage -65°F to 300°F (-54°C to 150°C)

Humidity

Connector Version 95% Relative humidity

Cable Version Immersible to IP67 (fluid must not enter the ends of the cable)

Acceleration Response Above 500 psi (35 bar) $\pm 0.02\%$ F.R.O./g; below 500 psi (35 bar) $\pm 0.10\%$ F.R.O./g

Vibration Surpasses MIL STD810C Method 514-2 Curve L and EUROCAE ED 14A/RTCA 160A

Shock 1000 g for 5 msec will not damage the sensor

EMC The P940, P950, P960 and P980 and P990 Series are CE marked, and when correctly installed comply with the EMC Directive 89/336/EEC Generic Standards for Residential Commercial, Light Industrial and Industrial environments. Note: The P980 Series when used in Intrinsic Safety applications does not comply with the Industrial environment directive.

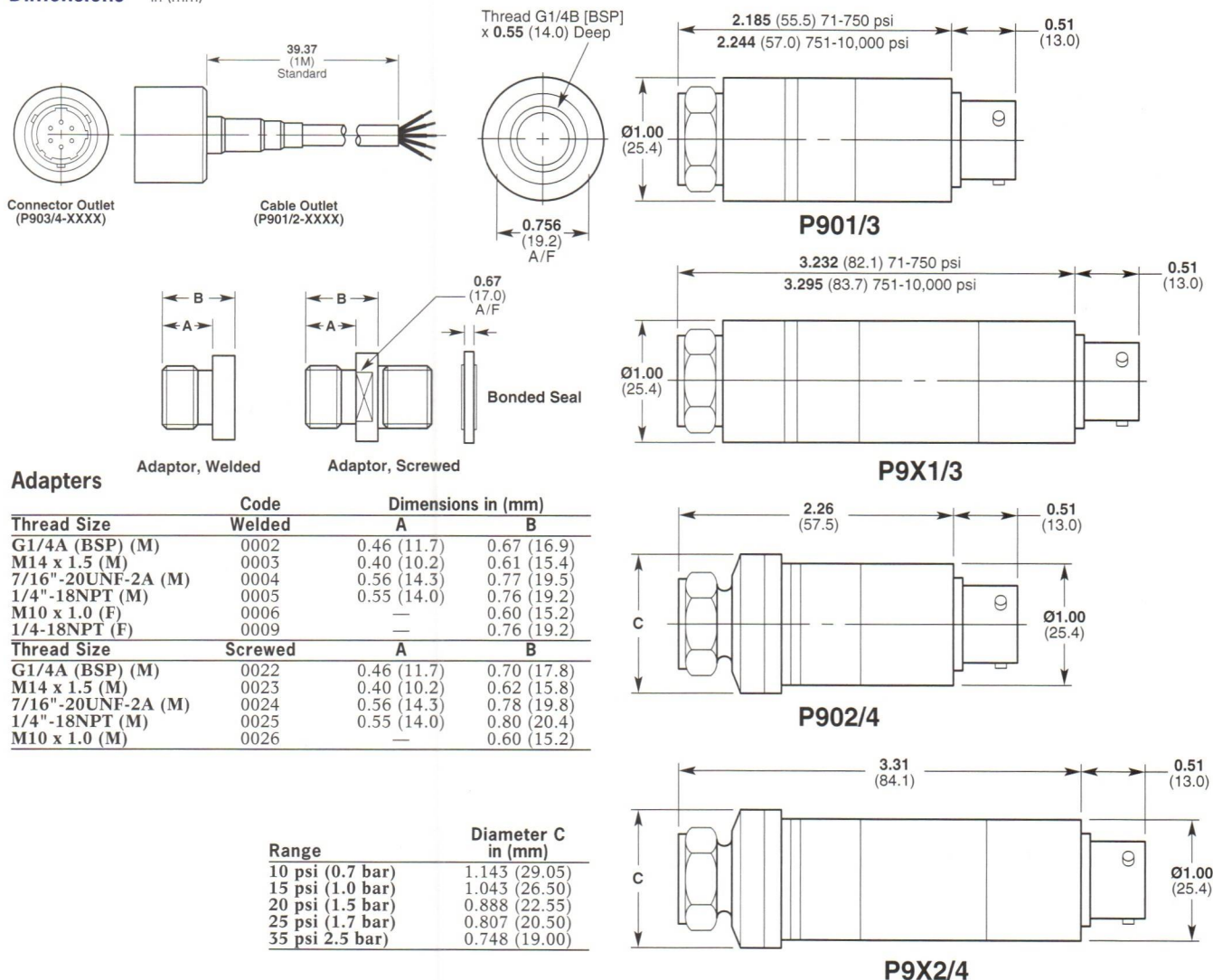
Insulation Resistance 500 Mohm at 50 VDC at 25°C

¹ Vented gauge units must only be used in dry, noncorrosive environments and will breathe through the cable vent tube or hole in the 6-way receptacle.

P900 Series

Premium Performance Strain Gauge

Dimensions in (mm)



Connections

| Cable | Connector ² |
|---------------------|--|
| Red ¹ | Pin A ¹ Excitation (+) |
| White | Pin D Excitation (-) ⁴ |
| Yellow | Pin B Output (+) |
| Blue ^{1,3} | Pin C ^{1,3} Output (-) ⁴ |
| Violet | Pin E } 80% shunt calibration ⁵ |
| Grey | Pin F } |

Note: Screen is connected to the case for CE marked units.
Screen is not connected to the case for optional IS units (P980).
IS certification revokes CE certification.

¹ 2-wire transmitter connections

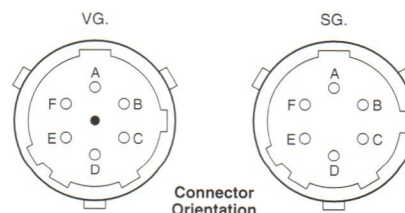
² Vented gauge units must breathe through the receptacle (mating connector must have a vent hole)

³ 0 Volt P990 series

⁴ Connected internally for P940, P950, P960 Series (3-wire)

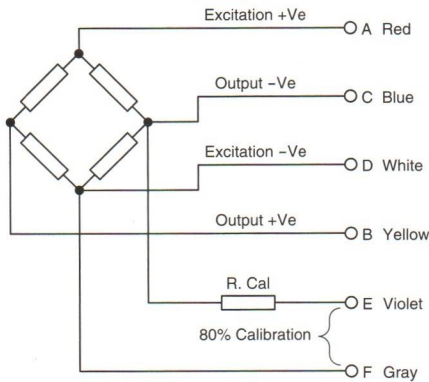
⁵ Shunt calibration not fitted to P980 Series

Connector Orientation

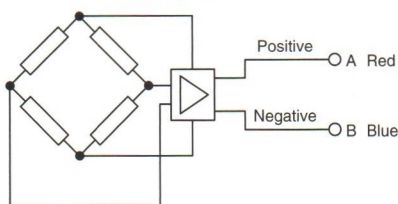


Wiring

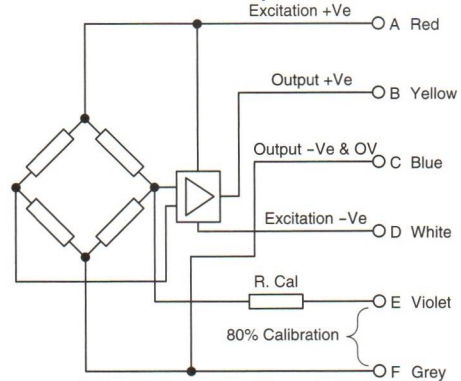
P901/4



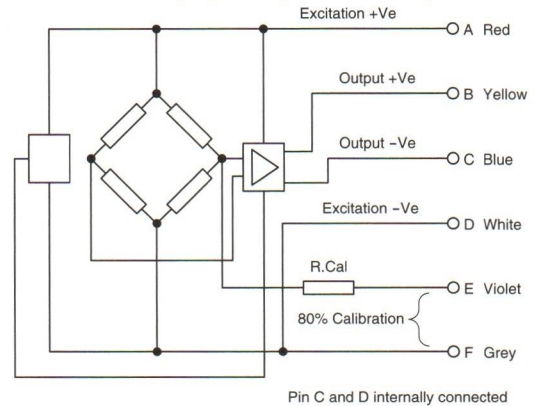
P981/4



P991/4



P941/4, P951/4 and P961/4



How to Order

Specify by transducer excitation, electrical interface, pressure port, pressure range, units, and pressure reference. Example: P961-0005-10 bar A signifies a pressure transducer with 0 to 5 VDC output operating from 18-32V, cable outlet and 1/4 inch-18 NPT male pressure port, ranged 0 to 10 bar, with an absolute pressure reference.

| Model Number Code | | P9 | | 0 | | | | | | | |
|---|--|----|--|---|--|--|--|--|--|--|--|
| Input/Output 0 – 20 mV output 4 – 5 V output (10 V supply) 5 – 2.5 V output (11-18 V supply) 6 – 5 V output (18-32 V supply) 8 – 4-20 mA output (10-36 V supply) 9 – 5 V output (± 15 V supply) | | | Intrinsic Safety 0 – Non IS 9 – IS (P980 only) | | | Adaptor 0 – Welded 2 – Screw in | | | Unit B: bar P: psi | | |
| Cable/Connector (Please reference to selected pressure range) 1 – High Range – cable outlet 2 – Medium Range – cable outlet 3 – High Range – connector outlet 4 – Medium Range – connector outlet | | | | | | | | | Pressure Reference A: absolute SG: sealed gauge VG: vented gauge | | |
| Corrosion resistant pressure transducers are available with wetted parts manufactured from Inconel 625 – consult factory for specifications. | | | Pressure Port 1 – 1/4 in BSP female 2 – 1/4 in BSP male 3 – M14 x 1.5 male 4 – 7/16 in 20 UNF 2A male 5 – 1/4 in 18 NPT male (taper) 6 – 10 x 1 mm Arsero Ermeto female 9 – 1/4 in 18 NPT female | | | | | | Pressure Range (Enter full scale pressure range without units) High (psi) 0-75; 100; 150; 200; 250; 350; 500; 750; 1000; 1500; 2200; 3500; 5000; 7500; 10,000 (bar) 0-5; 7; 10; 15; 25; 35; 50; 70; 150; 200; 250; 350; 500; 700 Medium (psi) 0-10; 15; 20; 25; 35 (bar) 0.7; 1.0; 1.5; 1.7; 2.5 | | |

P1200 Series

Pressure Transducer

The P1200 Series pressure transducers and transmitters provide high accuracy pressure measurement of liquids and gases. These robust transducers combine hybrid electronics with highly reliable strain gauge sensing technology to offer superior performance in rugged applications. Constructed from media compatible 17-4 pH stainless steel, the P1200 provides exceptional performance in extreme environments.

Accuracy of the P1200 is guaranteed to be within $\pm 0.20\%$ F.R.O. over a wide temperature compensated range of -20° to 80°C . The P1200 is available with either cable or connector terminations and offers a variety of outputs including 0-20 mV, 0-100 mV, 0-5 V and 4-20 mA. Six selectable pressure ports are available to suit most application requirements. Pressure ranges include 0-75 psi to 10,000 psi (0-5 bar to 700 bar) and can be referenced in absolute, sealed or vented gauge. The P1200 Series maintains a high burst rate of greater than 20x the rated pressure and 5x overpressure limit without damage to the sensor due to a positive overtravel stop.



Applications

- ☐ *Vehicle brake system monitoring*
- ☐ *Gas production*
- ☐ *Farm machinery*
- ☐ *Hydraulic control monitoring*

Common Specifications

Features

- ☐ *Typical accuracy of $< \pm 0.15\%$ F.R.O.*
- ☐ *Cable/connector termination*
- ☐ *Stainless steel media isolated*
- ☐ *5x overpressure protection*
- ☐ *High and low level output*

Pressure Ranges

High (psi) 0-75; 100; 150; 220; 250; 350; 500; 750; 1000; 1500; 2200; 2900; 3500; 5000; 7500; 10,000
(bar) 0-5; 7; 10; 15; 20; 25; 35; 50; 70; 100; 150; 200; 250; 350; 500; 700

Pressure References Vented gauge (Sensors should only breathe dry noncorrosive gases. Sealed gauge and absolute to special order.)

Pressure Limit $> 5\times$ full range pressure or 12,000 psi (830 bar), whichever is less.

Burst Pressure $> 20\times$ full range pressure or 22,000 psi (1,520 bar), whichever is less

Pressure Media Liquids or gases compatible with 17-4 pH stainless steel

Combined Nonlinearity, Hysteresis

and Nonrepeatability $< \pm 0.15\%$ F.R.O. (typ); $\pm 0.20\%$ F.R.O. max (BSL) – high range

Temperature Range

Operable -65°F to 185°F (-54°C to 85°C) [P1221/4 -65°F to 250°F (-54°C to 120°C)]

Compensated -4°F to 185°F (-20°C to 85°C) [P1221/4 -4°F to 212°F (-20°C to 100°C)]

Combined Thermal Zero

and Sensitivity Shift $< \pm 0.010\%$ F.R.O./ $^{\circ}\text{F}$ ($\pm 0.02\%$ F.R.O./ $^{\circ}\text{C}$) over compensated temperature range

Total Thermal Error Band*

(including NLH)%F.R.O. -4° to 185°F (-20° to 85°C) $\pm 1.2\%$ typical, $\pm 2.0\%$ max. (over compensated temperature range)

Shock Resistance 1000 g for 5 msec

Vibration Resistance Surpasses MIL STD810C Method 514-2 Curve L and EUROCAE ED 14A/RTCA 160A

Humidity

Connector Version 95% Relative humidity

Cable Version Immersible to IP67

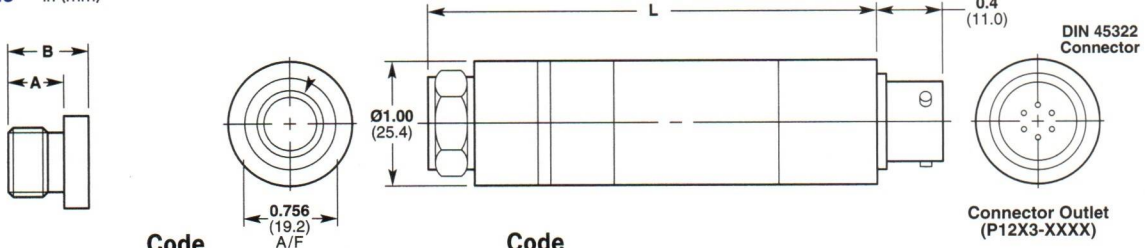
EMC Emissions to EN55022 (CISPR 22) Limit B; Radiated Immunity to IEC 801-3 Level 3 10 V/m; Burst Transients to IEC 801-4 Level 3 (2kV); Electrostatic Discharge to IEC 801-2 Level 2 (4kV contact); Surges to IEC 801-5 class 3 (2kV)

Insulation Resistance 500 Mohm at 50 VDC

Specifications by Model All specifications are at 77° F (25°C) unless otherwise noted

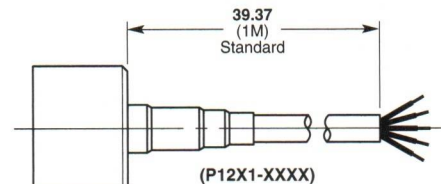
| Series | P1220 | P1230 | P1240 | P1260 | P1280 |
|---------------------------------|----------------------|----------------------|----------------------|-----------|--|
| Model Number | P1221/3 | P1231/3 | P1241/3 | P1261/3 | P1281/3 |
| Input Voltage | 10 VDC (12 V max) | 10 VDC (12 V max) | 10 VDC (12 V max) | 18-32 VDC | 10-36 VDC |
| Impedance (ohms) | 1000 to 1600 | — | — | — | — |
| Current (mA max) | 10 | 12 | 12 | 25 | — |
| Full Range Output ($\pm 2\%$) | 20 mV | 100 mV | 5 VDC | 5 VDC | 4-20 mA (16 mA $\pm 2\%$) |
| Impedance (ohms) | 1000 ± 50 | <10 | <10 | <10 | Load Resistance 1300 ohm (max) at 36 VDC |
| Current (mA max) | — | — | 5 | 5 | — |
| Residual Unbalance % F.R.O. | < ± 2 | < ± 2 | < ± 2 | < ± 2 | 4.0 mA ± 2.0 |
| Frequency Response | 2.5 to 40 kHz | 2 kHz | 2 kHz | 2 kHz | 1000 Hz |
| Weight oz (gm) | 3.4 (95) | 4.4 (125) | 4.4 (125) | 4.4 (125) | 4.4 (125) |

Dimensions in (mm)



Adapters

| Thread Size | Code Welded | A | B | Code Screw in | B |
|--------------------|-------------|-------------|-------------|---------------|-------------|
| G1/4A (BSP) (F) | 0001 | | | | |
| G1/4A (BSP) (M) | 0002 | 0.46 (11.7) | 0.67 (16.9) | 0022 | 0.76 (17.6) |
| M14 x 1.5 (M) | 0003 | 0.40 (10.2) | 0.61 (15.4) | 0023 | 0.61 (15.6) |
| 7/16"-20UNF-2A (M) | 0004 | 0.56 (14.3) | 0.77 (19.5) | 0024 | 0.77 (19.6) |
| 1/4"-18NPT (M) | 0005 | 0.55 (14.0) | 0.76 (19.2) | 0025 | 0.81 (20.6) |
| M10 x 1.0 (F) | 0006 | — | 0.60 (15.2) | 0026 | 0.60 (15.2) |



Model Number Code P12 — 00 —

Input/Output

- 2 – 20 mV output
- 3 – 100 mV output
- 4 – 5 V output (10 V supply)
- 6 – 5 V output (18-32 V supply)
- 8 – 4-20 mA output (10-36 V supply)

Adaptor

- 0 – Welded
- 2 – Screw in

Pressure Port

- 1 – 1/4 in BSP female
- 2 – 1/4 in BSP male
- 3 – M14 x 1.5 male
- 4 – 7/16 in 20 UNF 2A male
- 5 – 1/4 in 18 NPT male
- 6 – M10 x 1.0 female

Unit

- B: bar
- P: psi

Pressure Reference

- A: absolute
- S: sealed gauge
- V: vented gauge

Cable/Connector

- (Please reference to selected pressure range)
- 1 – Cable outlet
- 3 – Connector outlet

Pressure Range

(Enter full scale pressure range without units)
 (psi) 0-75; 100; 150; 220; 250; 350;
 500; 750; 1000; 1500; 2200;
 2900; 3500; 5000; 7500; 10,000
 (bar) 0-5; 7; 10; 15; 25; 35; 50; 70;
 100; 150; 200; 250; 350; 500;
 700

Connections

| Cable | Connector** | |
|--------|-------------|----------------|
| Red* | Pin 1 | Excitation (+) |
| Yellow | Pin 2 | Output (+) |
| Blue* | Pin 3 | Output (-) |
| White | Pin 4 | Excitation (-) |
| Grey | Pin 5 | Not used |
| Violet | | Not used |

How to Order

Specify by transducer excitation, electrical interface, pressure port, pressure range, units, and pressure reference. Example: P1221-0005-BVG signifies a pressure transducer with 20 mV output, cable outlet, welded adaptor, and 1/4 inch-18 NPT male pressure port, ranged 0 to 10 bar vented gauge.

* 2-wire transmitter connection, shield not connected to transducer

P1400 Series

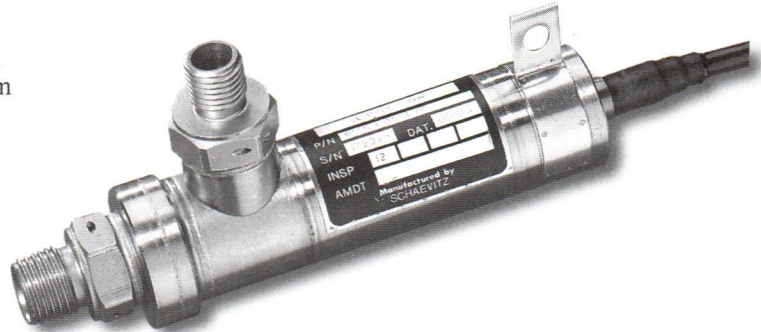
Strain Gauge Pressure Sensor

Schaevitz® P1400 Series Strain Gauge Pressure Transducers are sensors that provide highly precise measurement of wet/dry differential pressures over wide temperature ranges.

Standard versions of this transducer use a 17-4 pH stainless steel diaphragm to sense pressure. The deflection of the diaphragm is transferred to a double cantilever beam by a force transfer rod. Strain in the beam, and therefore, input pressure is measured by four foil strain gauges.

An all-welded construction provides high reliability and stability. Capable of sensing extremely small changes of applied pressure, the transducers are relatively insensitive to vibration, altitude and shock.

The P1400 Series are available in a range of electrical inputs and outputs.



Features

- ☐ *Bi-directional operation*
- ☐ *Operation in high temperatures*
- ☐ *Shock and vibration resistant*
- ☐ *2 wire 4-20 mA option: Intrinsic safety approval to EEx ia IIc T4 ($T_{amb}=60^{\circ}\text{C}$), BASEFA, CENELEC EN50-020*

Applications

- ☐ *Military and commercial aircraft*
- ☐ *Filter blockage detection*
- ☐ *Process control*
- ☐ *Valve/position monitoring*

Specifications by Model @ 77°F (25°C)

| Model Number | P1401/4 | P1441/4 | P1451/4 | P1461/4 | P1481/4 | P1491/4 |
|--|--|-----------|-----------|-----------|------------------------------------|-----------|
| Input Voltage | 10 VDC (12 V max) | 10 VDC | 11-18 VDC | 18-32 VDC | 10-36 VDC | ±15 VDC |
| Current | 13 mA | 20 mA | 20 mA | 25 mA | — | 20 mA |
| Output (F.R.O.) | | | | | | |
| Full Range Output (±1%) | 25 mV | 5 VDC | 2.5 VDC | 5 VDC | 4-20 mA | 5 VDC |
| Impedance (ohm) | 350 ±5% | <10 | <10 | <10 | Load Resist. 1300 max. @ 36 VDC | <10 |
| Current mA (max) | — | 5 | 5 | 5 | — | 5 |
| Frequency Response | Approx. 2.5 kHz for 0.7 bar to 20 kHz for 70 bar | 1 kHz | 1 kHz | 1 kHz | 100 Hz | 1 kHz |
| Combined Thermal Zero & Sensitivity Shift | | | | | | |
| % F.R.O./°F | ±0.008 | ±0.008 | ±0.008 | ±0.008 | ±0.008 | ±0.008 |
| % F.R.O./°C | ±0.015 | ±0.015 | ±0.015 | ±0.015 | ±0.015 | ±0.015 |
| Residual Unbalance (%FRO) | ±1% | ±1% | ±1% | ±1% | ±1% | ±1% |
| Weight oz (gm) | | | | | | |
| Cable | 7.4 (210) | 8.1 (230) | 8.1 (230) | 8.1 (230) | 8.1 (230) | 8.1 (230) |
| Connector | 6.2 (175) | 6.9 (195) | 6.9 (195) | 6.9 (195) | 6.9 (195) | 6.9 (195) |

Select P1400 models, when correctly installed, are CE certified to comply with the EMC Directive 89/336/EEC Generic Standards for Residential, Commercial, Light Industrial and Industrial Environments.



P1400 Series

Pressure Ranges: 0-10 to 1000 psi
(0-0.7 to 70 bar)

Accuracy: $\leq \pm 0.25\%$ F.R.O.

Common Specifications

Pressure Ranges

| | | |
|---------------|--------------------|-------------------------------------|
| High | (psi) | 0-75; 100; 150; 300; 500; 750; 1000 |
| | (bar) | 0-5; 7; 10; 20; 35; 50; 70 |
| Medium | (psi) | 0-10; 15; 25; 35 |
| | (bar) | 0-0.7; 1.0; 1.7; 2.5 |

Pressure References

All Ranges Uni-directional (UD); bi-directional (BD) optional

Differential Pressure Limit

| | |
|-----------------|--|
| P1 | 5x full range pressure. |
| P2 | 2x full range pressure. (P1 must always be >P2 pressure) |

Line Pressure 2X nominal pressure or 500 psi (35 bar) whichever is less

Burst Pressure

| | |
|-----------------|---|
| P1 | >10 x full range pressure (350 bar max) |
| P2 | >5 x full range pressure (100 bar max) |

Zero Shift with Line Pressure

| | |
|---------------------------|-------------------------------------|
| High Range | $\leq \pm 0.25\%$ F.R.O. per 7 bar |
| Medium Range | $\leq \pm 0.25\%$ F.R.O. per 14 bar |

Pressure Media P1: Liquids or gases compatible with 17-4 pH; P2: Must only be connected to dry gas

Shunt Calibration 80% $\pm 5\%$ full range pressure (not fitted in P1480 Series)

Combined Nonlinearity, Hysteresis

and Nonrepeatability $\leq \pm 0.25\%$ F.R.O. (BSL)

Temperature Range

| | |
|--------------------------|---------------------------------|
| Operable | -65°F to 250°F (-54°C to 120°C) |
| Compensated | 4°F to 176°F (-20°C to 80°C) |

Storage -65°F to 300°F (-54°C to 150°C)

Humidity

| | |
|--------------------------------|---|
| Connector Version | 95% Relative humidity |
| Cable Version | Immersible to IP67 (fluid must not enter the ends of the cable) |

Acceleration Response $< 0.12\%$ F.R.O./g for 0.7 bar decreasing to less than $\pm 0.02\%$ F.R.O./g for 35 bar and above

Vibration Surpasses MIL STD810C Method 514-2 Curve L and EUROCAE ED 14A/RTCA 160A

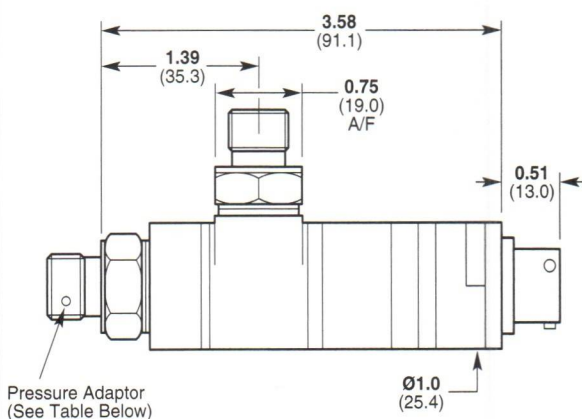
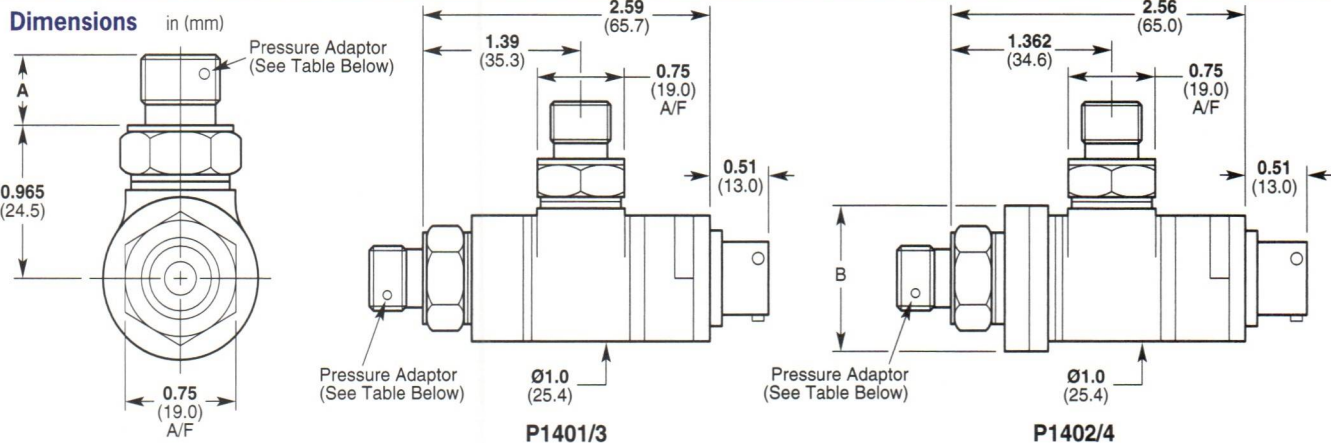
Shock 1000 g for 5 msec will not damage the sensor

EMC The P1440, P1450, P1460, P1480 and P1490 Series are CE marked, and when correctly installed comply with the EMC Directive 89/336/EEC Generic Standards for Residential Commercial, Light Industrial and Industrial environments. Note: The P1480 Series when used in Intrinsic Safety applications does not comply with the Industrial environment directive.

Insulation Resistance 500 Mohm at 50 VDC at 25°C

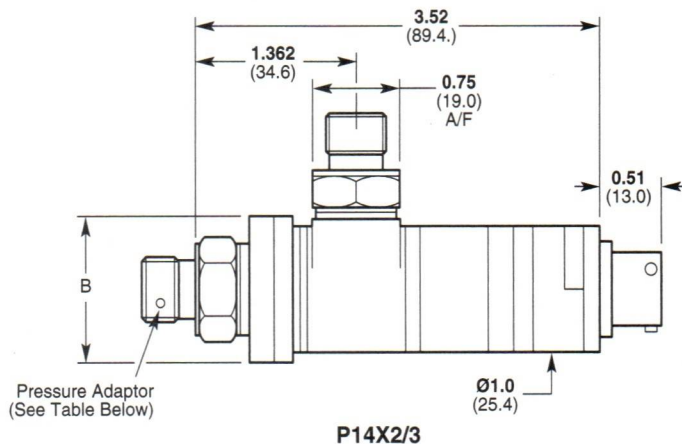
P1400 Series

Strain Gauge Pressure Sensor



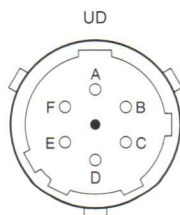
Adapters

| Thread Size | Code | Dimensions in (mm) |
|--------------------|------|--------------------|
| Welded | A | |
| 1/4" BSP (F) | 0001 | 0.47 (11.9) |
| 1/4" BSP (M) | 0002 | 0.46 (11.7) |
| M14 x 1.5 (M) | 0003 | 0.40 (10.2) |
| 7/16"-20UNF-3A (M) | 0004 | 0.56 (14.2) |
| 1/4"-18NPT (M) | 0005 | 0.55 (14.0) |
| M10 x 1.0 (F) | 0006 | 0.39 (9.9) |
| 1/4"-18NPT (F) | 0009 | 0.57 (14.4) |



| Range | Diameter B in (mm) |
|------------------|--------------------|
| 10 psi (0.7 bar) | 1.143 (29.05) |
| 15 psi (1.0 bar) | 1.043 (26.50) |
| 25 psi (1.7 bar) | 0.807 (20.50) |
| 35 psi (2.5 bar) | 0.748 (19.00) |

Connector Orientation



Connections

| Cable | Connector ² |
|---------------------|--|
| Red ¹ | Pin A ¹ Excitation (+) |
| White | Pin D Excitation (-) ⁴ |
| Yellow | Pin B Output (+) |
| Blue ^{1,3} | Pin C ^{1,3} Output (-) ⁴ |
| Violet | Pin E } 80% shunt calibration ⁵ |
| Grey | Pin F } |

Note: Screen is connected to the case for CE marked units. Screen is not connected to the case for optional IS units (P1480). IS certification revokes CE certification.

¹ 2-wire transmitter connections (max cable length is 20 meters when I.S.)

² Vented gauge units must breathe through the receptacle (mating connector must have a vent hole)

³ 0 Volt P1490 Series

⁴ Connected internally for P1440, P1450, P1460 Series (3-wire)

⁵ Shunt calibration not fitted to P1480 Series

Select P1400 models, when correctly installed, are CE certified to comply with the EMC Directive 89/336/EEC Generic Standards for Residential, Commercial, Light Industrial and Industrial Environments.



P1400 Series

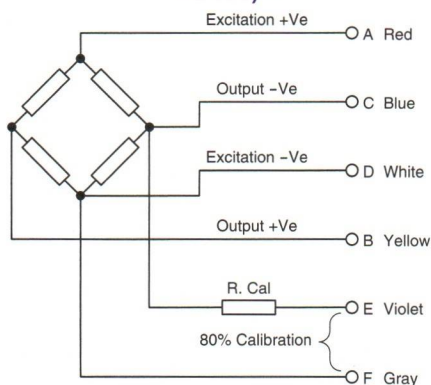
Pressure Ranges: 0-10 to 1000 psi

(0-0.7 to 70 bar)

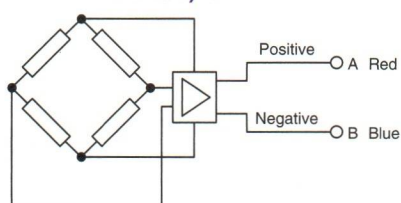
Accuracy: $\leq \pm 0.25\%$ F.R.O.

Wiring

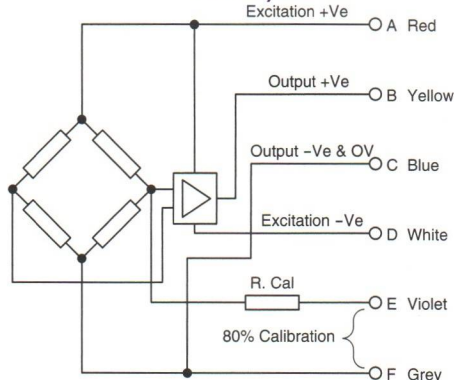
P1401/4



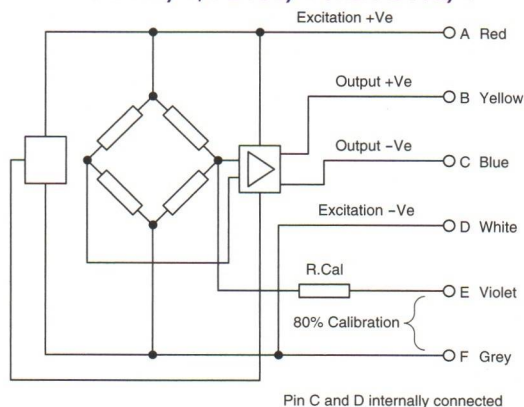
P1481/4



P1491/4



P1441/4, P1451/4 and P1461/4



How to Order

Specify by transducer excitation, electrical interface, pressure port, pressure range, UD units, and pressure reference.
Example: P1461-0005-10 bar A signifies a pressure transducer with 0 to 5 VDC output operating from 18-32V, cable outlet and 1/4 inch-18 NPT male pressure port, ranged 0 to 10 bar, with uni-directional pressure reference.

Model Number Code P14

Input/Output

- 0 – 20 mV output
- 4 – 5 V output (10 V supply)
- 5 – 2.5 V output (11-18 V supply)
- 6 – 5 V output (18-32 V supply)
- 8 – 4-20 mA output (10-36 V supply)
- 9 – 5 V output (± 15 V supply)

Intrinsic Safety

- 0 – Non IS
- 9 – IS (P1480 only)

Adaptor

- 0 – Welded
- 2 – Screw in

Unit

- B: bar
- P: psi

Pressure Reference

- UD: uni-directional
- BD: bi-directional

Cable/Connector

- (Please reference to selected pressure range)
- 1 – High Range – cable outlet
 - 2 – Medium Range – cable outlet
 - 3 – High Range – connector outlet
 - 4 – Medium Range – connector outlet

Pressure Port

- 1 – 1/4 in BSP female
- 2 – 1/4 in BSP male
- 3 – M14 x 1.5 male
- 4 – 7/16 in 20 UNF 2A male
- 5 – 1/4 in 18 NPT male (taper)
- 6 – 10 x 1 mm Arsero Ermeto female
- 9 – 1/4 in 18 NPT female

Pressure Range

- (Enter full scale pressure range without units)
- | | | |
|--------|-------|-------------------------------------|
| High | (psi) | 0-75; 100; 150; 300; 500; 750; 1000 |
| | (bar) | 0-5; 7; 10; 20; 35; 50; 70 |
| Medium | (psi) | 0-10; 15; 25; 35 |
| | (bar) | 0.7; 1.0; 1.7; 2.5 |

CHAEVITZ
SENSORS

P1500 Series

High Performance Low Level Pressure Sensor

Schaevitz® P1500 Series Strain Gauge Pressure Transducers are high grade sensors that provide highly precise measurement of absolute or vented gauge pressures over wide temperature ranges.

Standard versions of this transducer use a 17-4 pH stainless steel diaphragm to sense pressure. The deflection of the diaphragm is transferred to a double cantilever beam by a force transfer rod. Strain in the beam, and therefore, input pressure is measured by four foil strain gauges.

An all-welded construction provides high reliability and stability. Capable of sensing extremely small changes of applied pressure, the transducers are relatively insensitive to vibration, altitude and shock.

The P1500 Series are available in a range of electrical inputs and outputs. Zero and span potentiometers are available as a special option with the P1540, P1550, P1560 and P1590 models.



Features

- ❑ **High overload capability**
- ❑ **Operation in high temperatures**
- ❑ **Shock and vibration resistant**
- ❑ **2 wire 4-20 mA option: Intrinsic safety approval to EEx ia IIC T4 ($T_{amb}=60^{\circ}\text{C}$), BASEFA, CENELEC EN50-020**

Applications

- ❑ **Pneumatic pressure monitoring**
- ❑ **Climate room control**
- ❑ **Vehicle brake system monitoring**
- ❑ **Military and commercial aircraft**

Specifications by Model @ 77°F (25°C)

| Model Number | P1502/4 | P1542/4 | P1552/4 | P1562/4 | P1582/4 | P1592/4 |
|---|--|------------|------------|------------|------------------------------------|------------|
| Input Voltage | 10 VDC (12 V max) | 10 VDC | 11-18 VDC | 18-32 VDC | 10-36 VDC | ±15 VDC |
| Current | 28 mA | 20 mA | 20 mA | 25 mA | — | 20 mA |
| Output (F.R.O.) | | | | | | |
| Full Range Output (±1%) | | | | | | |
| 100 mbar | 20 mV | 5 VDC | 2.5 VDC | 5 VDC | 4-20 mA | 5 VDC |
| 200 mbar & 300 mbar | 25 mV | 5 VDC | 2.5 VDC | 5 VDC | 4-20 mA | 5 VDC |
| Impedance (ohm) | 350 ±5% | <10 | <10 | <10 | Load Resist. 1300 max. @ 36 VDC | <10 |
| Current mA (max) | — | 5 | 5 | 5 | — | 5 mA |
| Frequency Response | Approx. 1.0 kHz for 100 mbar to approx. 2 kHz for 350 mbar | 1 kHz | 1 kHz | 1 kHz | 100 Hz | 1 kHz |
| Combined Thermal Zero & Sensitivity Shift | | | | | | |
| % F.R.O./°F | ±0.008 | ±0.008 | ±0.008 | ±0.008 | ±0.008 | ±0.008 |
| % F.R.O./°C | ±0.015 | ±0.015 | ±0.015 | ±0.015 | ±0.015 | ±0.015 |
| Residual Unbalance (%FRO) | ±4% | ±1% | ±1% | ±1% | +1-0% | ±1% |
| Weight oz (gm) | | | | | | |
| Cable 100 & 200 mbar | 12.5 (350) | 13.2 (370) | 13.2 (370) | 13.2 (370) | 13.2 (370) | 13.2 (370) |
| Cable 350 mbar | 8.9 (250) | 9.6 (270) | 9.6 (270) | 9.6 (270) | 9.6 (270) | 9.6 (270) |
| Connector 100 & 200 mbar | 11.4 (320) | 12.1 (340) | 12.1 (340) | 12.1 (340) | 12.1 (340) | 12.1 (340) |
| Connector 350 mbar | 7.9 (220) | 8.6 (240) | 8.6 (240) | 8.6 (240) | 8.6 (240) | 8.6 (240) |

Select P1500 models, when correctly installed, are CE certified to comply with the EMC Directive 89/336/EEC Generic Standards for Residential, Commercial, Light Industrial and Industrial Environments.



P1500 Series

Pressure Ranges: 0-1.5 to 0-5 psi
(0-100 to 350 mbar)

Accuracy: $\leq \pm 0.25\%$ F.R.O.

Common Specifications

Pressure Ranges

Low (psi) 0-1.5; 3.0; 5.0
(mbar) 0-100; 200; 350

Pressure References Vented gauge¹ and Absolute

Pressure Limit $\geq 10\times$ full range pressure. Will not cause a zero offset exceeding 0.05% FRO (recoverable within one hour)

Burst Pressure $\geq 20\times$ full range pressure

Pressure Media Liquids or gases compatible with 17-4 pH and 17-7 pH stainless steel

Shunt Calibration 80% $\pm 5\%$ full range pressure (not fitted in P1580 Series)

Combined Nonlinearity, Hysteresis

and Nonrepeatability $\leq \pm 0.25\%$ F.R.O. (BSL)

Temperature Range

Operable -65°F to 250°F (-54°C to 120°C)

Compensated 32°F to 212°F (0°C to 100°C)

Storage -65°F to 300°F (-54°C to 150°C)

Humidity

Connector Version 95% Relative humidity

Cable Version Immersible to IP67 (fluid must not enter the ends of the cable)

Acceleration Response

0-100 mbar $\pm 1.0\%$ F.R.O./g nominal

0-200 mbar $\pm 0.5\%$ F.R.O./g nominal

0-350 mbar $\pm 0.4\%$ F.R.O./g nominal

Vibration Surpasses MIL STD810C Method 514-2 Curve L and EUROCAE ED 14A/RTCA 160A

Shock 1000 g for 5 msec will not damage the sensor

EMC The P1540, P1550, P1560, P1580 and P1590 Series are CE marked, and when correctly installed comply with the EMC Directive 89/336/EEC Generic Standards for Residential Commercial, Light Industrial and Industrial environments. Note: The P1580 Series when used in Intrinsic Safety applications does not comply with the Industrial environment directive.

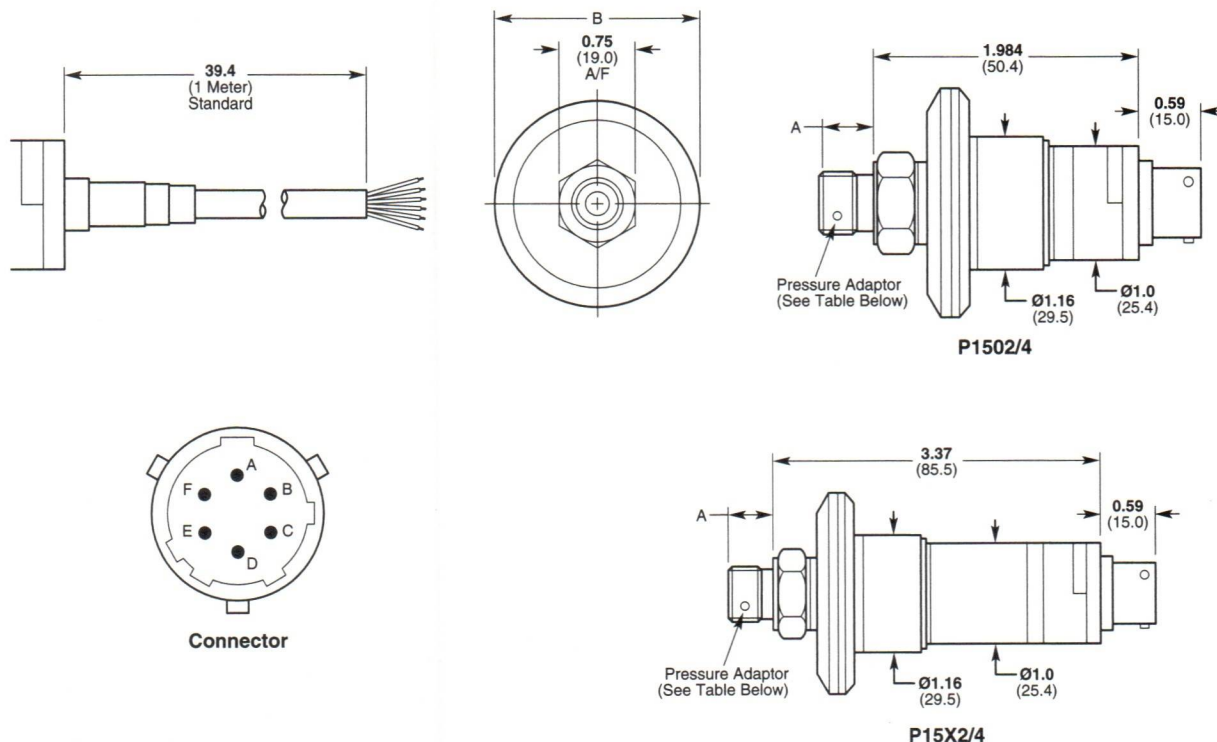
Insulation Resistance 500 Mohm at 50 VDC at 25°C

¹ Vented gauge units must only be used in dry, noncorrosive environments and will breathe through the cable vent tube or hole in the 6-way receptacle.

P1500 Series

High Performance Low Level Pressure Sensor

Dimensions in (mm)

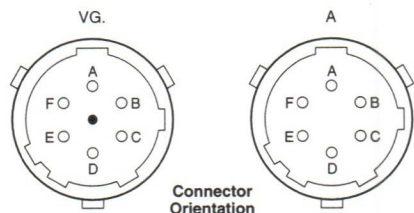


Adapters

| Thread Size | Code | Dimensions in (mm) |
|--------------------|--------|--------------------|
| | Welded | A |
| 1/4" BSP (F) | 0001 | 0.47 (11.9) |
| 1/4" BSP (M) | 0002 | 0.46 (11.7) |
| M14 x 1.5 (M) | 0003 | 0.40 (10.2) |
| 7/16"-20UNF-SA (M) | 0004 | 0.56 (14.2) |
| 1/4"-18NPT (M) | 0005 | 0.55 (14.0) |
| M10 x 1.0 (F) | 0006 | 0.39 (9.9) |
| 1/4"-18NPT (F) | 0009 | 0.57 (14.4) |

| Range | Diameter B in (mm) |
|--------------------|--------------------|
| 1.5 psi (100 mbar) | 1.976 (50.19) |
| 3.0 psi (200 mbar) | 1.976 (50.19) |
| 5.0 psi (350 mbar) | 1.644 (41.75) |

Connector Orientation



Connections

| Cable | Connector ² |
|---------------------|--|
| Red ¹ | Pin A ¹ Excitation (+) |
| White | Pin D Excitation (-) ⁴ |
| Yellow | Pin B Output (+) |
| Blue ^{1,3} | Pin C ^{1,3} Output (-) ⁴ |
| Violet | Pin E } 80% shunt calibration ⁵ |
| Grey | Pin F } |

Note: Screen is connected to the case for CE marked units. Screen is not connected to the case for optional IS units (P1580). IS certification revokes CE certification.

¹ 2-wire transmitter connections (max cable length is 20 meters when I.S.)

² Vented gauge units must breathe through the receptacle (mating connector must have a vent hole)

³ 0 Volt P1590 Series

⁴ Connected internally for P1540, P1550, P1560 Series (3-wire)

⁵ Shunt calibration not fitted to P1580 Series

CE

Pressure Ranges: 0-1.5 to 0-5 psi
(0-100 to 350 mbar)
Accuracy: $\leq \pm 0.25\%$ F.R.O.



P1600 Series

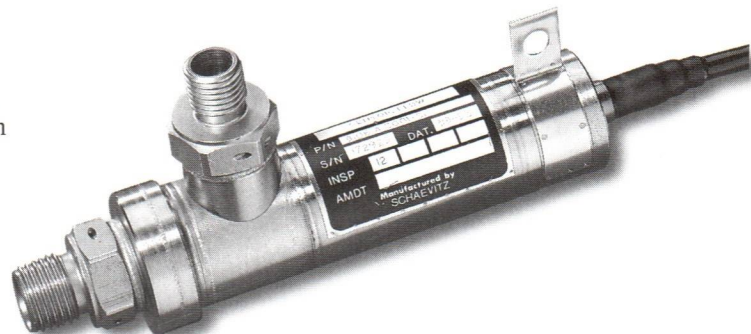
Strain Gauge Pressure Transducer

Schaevitz® P1600 Series Strain Gauge Pressure Transducers are sensors that provide highly precise measurement of wet/dry differential pressures over wide temperature ranges.

Standard versions of this transducer use a 17-4 pH stainless steel diaphragm to sense pressure. The deflection of the diaphragm is transferred to a double cantilever beam by a force transfer rod. Strain in the beam, and therefore, input pressure is measured by four foil strain gauges.

An all-welded construction provides high reliability and stability. Capable of sensing extremely small changes of applied pressure, the transducers are relatively insensitive to vibration, altitude and shock.

The P1600 Series are available in a range of electrical inputs and outputs.



Features

- ☐ **Bi-directional operation**
- ☐ **Operation in high temperatures**
- ☐ **Shock and vibration resistant**
- ☐ **2 wire 4-20 mA option: Intrinsic safety approval to EEx ia IIc T4 ($T_{amb}=60^{\circ}\text{C}$), BASEFA, CENELEC EN50-020**

Applications

- ☐ **Military and commercial aircraft**
- ☐ **Filter blockage detection**
- ☐ **Process control**
- ☐ **Valve/position monitoring**

Specifications by Model @ 77°F (25°C)

| Model Number | P1602/4 | P1642/4 | P1652/4 | P1662/4 | P1682/4 | P1692/4 |
|---|--|------------|------------|------------|------------------------------------|------------|
| Input Voltage | 10 VDC (12 V max) | 10 VDC | 11-18 VDC | 18-32 VDC | 10-36 VDC | ±15 VDC |
| Current | 13 mA | 20 mA | 20 mA | 25 mA | — | 20 mA |
| Output (F.R.O.) | | | | | | |
| Full Range Output (±1%) | | | | | | |
| 100 mbar | 20 mV | 5 VDC | 2.5 VDC | 5 VDC | 4-20 mA | 5 VDC |
| 200 mbar & 300 mbar | 25 mV | 5 VDC | 2.5 VDC | 5 VDC | 4-20 mA | 5 VDC |
| Impedance (ohm) | 1000 ±5% | <10 | <10 | <10 | Load Resist. 1300 max. @ 36 VDC | <10 |
| Current mA (max) | — | 5 | 5 | 5 | — | 5 |
| Frequency Response | Approx. 1.0 kHz for 100 mbar to approx. 2 kHz for 350 mbar | 1 kHz | 1 kHz | 1 kHz | 100 Hz | 1 kHz |
| Combined Thermal Zero & Sensitivity Shift | | | | | | |
| % F.R.O./°F | ±0.008 | ±0.008 | ±0.008 | ±0.008 | ±0.008 | ±0.008 |
| % F.R.O./°C | ±0.015 | ±0.015 | ±0.015 | ±0.015 | ±0.015 | ±0.015 |
| Residual Unbalance (%FRO) | ±1% | ±1% | ±1% | ±1% | ±1% | ±1% |
| Weight oz (gm) | | | | | | |
| Connector 100 & 200 mbar | 14.1 (400) | 14.8 (420) | 14.8 (420) | 14.8 (420) | 14.8 (420) | 14.8 (420) |
| Connector 350 mbar | 12.0 (340) | 12.0 (340) | 12.0 (340) | 12.0 (340) | 12.0 (340) | 12.0 (340) |

Select P1600 models, when correctly installed, are CE certified to comply with the EMC Directive 89/336/EEC Generic Standards for Residential, Commercial, Light Industrial and Industrial Environments.



P1600 Series

Pressure Ranges: 0-1.5 to 0-5 psi
(0-100 to 350 mbar)

Accuracy: $\leq \pm 0.25\%$ F.R.O.

Common Specifications

Pressure Ranges

Low (psi) 0-1.5; 3.0; 5.0
(mbar) 0-100; 200; 350

Pressure References

All Ranges Uni-directional (UD); bi-directional (BD) optional

Differential Pressure Limit

P1 10x full range pressure. 0-100 mbar; 5x full range pressure. 0-200 and 350 mbar
P2 2x full range pressure. (P1 must always be >P2 pressure)

Line Pressure 20X nominal pressure or 100 psi (7.0 bar) whichever is less

Burst Pressure

P1 >20 x full range pressure
P2 >5 x full range pressure

Zero Shift with

Line Pressure $\leq \pm 0.30\%$ F.R.O. per bar

Pressure Media P1: Liquids or gases compatible with 17-4 pH; P2: Must only be connected to dry gas

Shunt Calibration $80\% \pm 5\%$ full range pressure (not fitted in P1680 Series)

Combined Nonlinearity, Hysteresis

and Nonrepeatability $\leq \pm 0.25\%$ F.R.O. (BSL)

Temperature Range

Operable -65°F to 250°F (-54°C to 120°C)
Compensated 32°F to 212°F (0°C to 100°C)

Storage -65°F to 300°F (-54°C to 150°C)

Humidity

Connector Version 95% Relative humidity
Cable Version Immersible to IP67 (fluid must not enter the ends of the cable)

Acceleration Response

0-100 mbar $\pm 1.0\%$ F.R.O./g nominal
0-200 mbar $\pm 0.5\%$ F.R.O./g nominal
0-350 mbar $\pm 0.4\%$ F.R.O./g nominal

Vibration Surpasses MIL STD810C Method 514-2 Curve L and EUROCAE ED 14A/RTCA 160A

Shock 1000 g for 5 msec will not damage the sensor

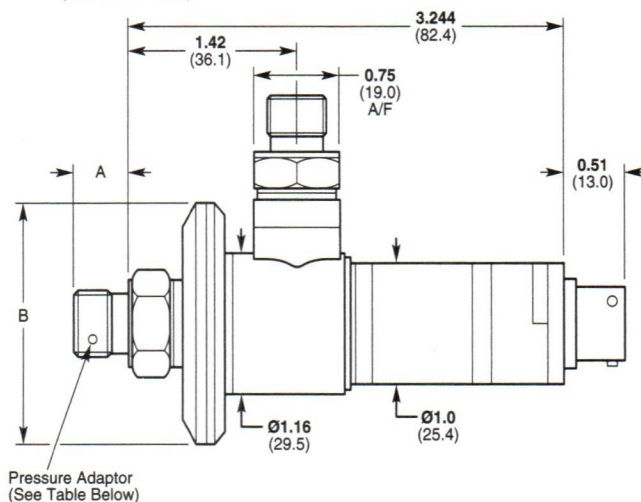
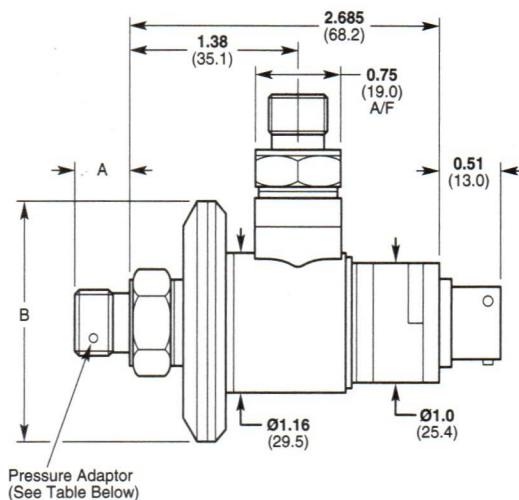
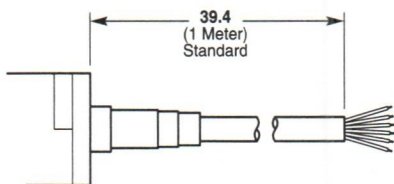
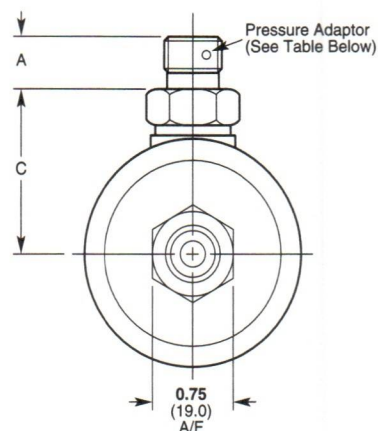
EMC The P1640, P1650, P1660, P1680 and P1690 Series are CE marked, and when correctly installed comply with the EMC Directive 89/336/EEC Generic Standards for Residential Commercial, Light Industrial and Industrial environments. Note: The P1680 Series when used in Intrinsic Safety applications does not comply with the Industrial environment directive.

Insulation Resistance 500 Mohm at 50 VDC at 25°C

P1600 Series

Strain Gauge Pressure Transducer

Dimensions in (mm)

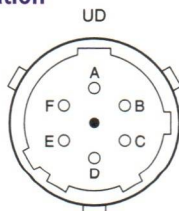


Adapters

| Thread Size | Code | Dimensions in (mm) |
|--------------------|--------|--------------------|
| | Welded | A |
| 1/4" BSP (F) | 0001 | 0.47 (11.9) |
| 1/4" BSP (M) | 0002 | 0.46 (11.7) |
| M14 x 1.5 (M) | 0003 | 0.40 (10.2) |
| 7/16"-20UNF-2A (M) | 0004 | 0.56 (14.2) |
| 1/4"-18NPT (M) | 0005 | 0.55 (14.0) |
| M10 x 1.0 (F) | 0006 | 0.39 (9.9) |
| 1/4"-18NPT (F) | 0009 | 0.57 (14.4) |

| Range | Diameter B in (mm) | Dimension C in (mm) |
|--------------------|--------------------|---------------------|
| 1.5 psi (100 mbar) | 1.976 (50.19) | 1.401 (35.75) |
| 3.0 psi (200 mbar) | 1.976 (50.19) | 1.401 (35.75) |
| 5.0 psi (350 mbar) | 1.644 (41.75) | 1.226 (31.15) |

Connector Orientation



Connections

| Cable | Connector ² |
|---------------------|--|
| Red ¹ | Pin A ¹ Excitation (+) |
| White | Pin D Excitation (-) ³ |
| Yellow | Pin B Output (+) |
| Blue ^{1,3} | Pin C ^{1,2} Output (-) ³ |
| Violet | Pin E } 80% shunt calibration ⁴ |
| Grey | Pin F } |

Note: Screen is connected to the case for CE marked units. Screen is not connected to the case for optional IS units (P1680). IS certification revokes CE certification.

¹ 2-wire transmitter connections (max cable length is 20 meters when I.S.)

² 0 Volt P1690 Series

³ Connected internally for P1640, P1650, P1660 Series (3-wire)

⁴ Shunt calibration not fitted to P1680 Series

Select P1600 models, when correctly installed, are CE certified to comply with the EMC Directive 89/336/EEC Generic Standards for Residential, Commercial, Light Industrial and Industrial Environments.



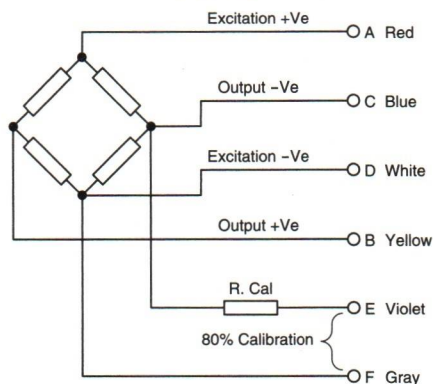
P1600 Series

Pressure Ranges: 0-1.5 to 0-5 psi
(0-100 to 350 mbar)

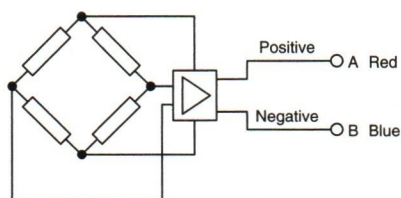
Accuracy: $\leq \pm 0.25\%$ F.R.O.

Wiring

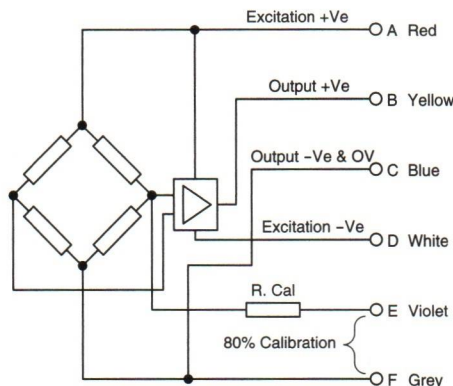
P1602/4



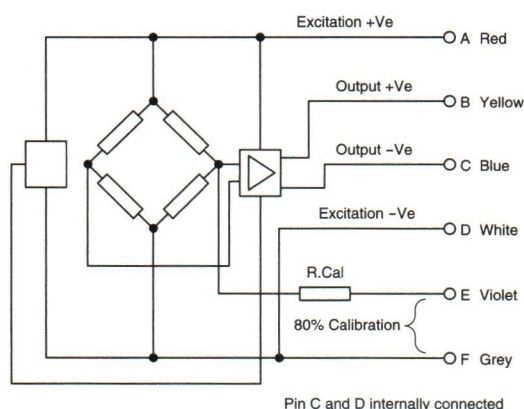
P1682/4



P1692/4



P1642/4, P1652/4 AND P1662/4



Designation and Ordering Information

Specify by transducer Type number, coding, pressure range and UD units and pressure reference.

Example: P1662-0005-10 bar signifies a pressure transducer with a 0 to 5 VDC output operating from 18-32V, cable outlet and 1/4 inch -18 NPT male pressure ports, ranged 0-10 bar, with uni-directional pressure reference.

Type No. & Code P21

0 - 25mV output
4 - 2.5V output (10V supply)
5 - 2.5V output (11-18V supply)
6 - 2.5V output (18-32V supply)
8 - 4-20 mA output (10-36V supply)
9 - 5V output (+15.0-15V supply)

Cable/Connector

(Please reference to selected pressure range)
2 - Low Range - cable outlet
4 - Low Range - connector outlet

Intrinsic Safety

0 - Non IS
9 - IS (P1680 only)

0 - Welded adaptor
2 - Screw in adaptor

Unit

B: mbar
P: psi

Pressure Reference

UD: uni-directional
BD: bi-directional

- 1 1/4 BSP female
- 2 1/4 BSP male
- 3 14 x 1.5 male
- 4 7/16 in-20 UNF 2A male
- 5 1/4 in-18 NPT male (taper)
- 6 10 x 1 mm Arsero Ermeto female
- 9 1/4 in 18 NPT female

Pressure Range

(Enter full scale pressure range without units)
Low (psi) 0-1.5; 3.0; 5.0
(mbar) 0-100; 200; 350

P9000 Series

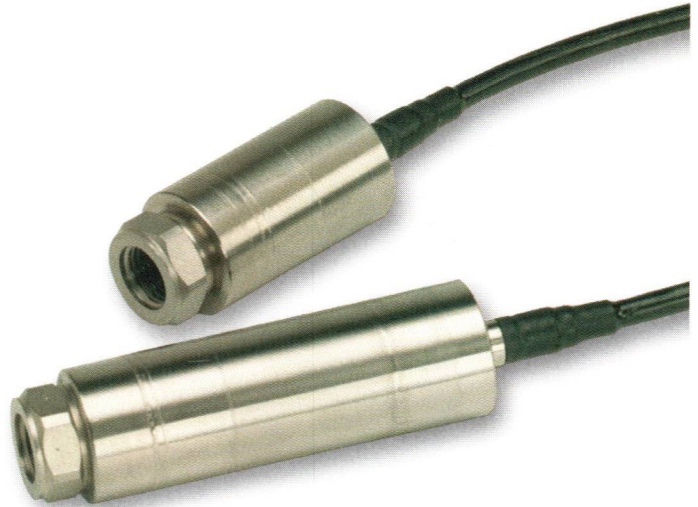
Digitally Compensated Pressure Transducer

The P9000 Series is the latest addition to the Schaevitz® family of advanced digitally compensated pressure transducers. The unique design of the P9000 pressure transducer utilizes the proven reliability of strain gauge technology and innovative digital compensation electronics. The synergy of these technologies result in an instrument grade pressure transducer. Available in pressure ranges from 75 psi to 10,000 psi (5 bar to 700 bar), the P9000 series can be configured with a variety of pressure ports, electrical outputs, and termination options to meet most pressure sensing needs.

The P9000 Series incorporates 12 bit digital compensation electronics to ensure precise calibration of all critical parameters. This unique circuit design also provides a significant advantage of maintaining a true analog "through-path" resulting in an exceptionally fast response of 1000 Hz without a sacrifice in accuracy. Error contribution sources are digitally corrected to guarantee repeatable performance and eliminate the need for user calibration. Combined nonlinearity hysteresis and non-repeatability errors are guaranteed to be less than $\pm 0.08\%$ F.R.O. with total thermal error limited to 0.004% F.R.O./°C over an extended industrial temperature range of -4°F to 185°F (-20°C to 85°C).

The P9000 series delivers the advantages of a 17-4 PH diaphragm offering a true stainless steel isolation barrier with high burst pressures, at 20x the rated pressure, and a proof pressure, up to 5x the rated pressure. Housed in a rugged 316 stainless steel, NEMA 4X, IP67 enclosure with guaranteed shock resistance of up to 1000g for 2msec, and vibration to $\pm 20g$, the P9000 provides a robust solution for a wide variety of demanding pressure applications and environments.

Available in both cable and connector outlets, the P9000 is offered in various electronic outputs: four wire 0-10 V, four wire 0 to 5 V and a 2 wire 4-20 mA intrinsically safe certified version. The P9000 can be configured to give 3 wire 1 to 6V or 1 to 11V output. All P9000 units are constructed under an ISO 9001 environment. Each unit is serialized and shipped with a calibration certificate guaranteeing the highest quality and reliability found in an instrument grade pressure transducer.



Features

- ☐ **Guaranteed accuracy of less than $\pm 0.08\%$ F.R.O.**
- ☐ **Intrinsically safe option to class EEx ia IIc T4 ($T_{amb}=60^{\circ}\text{C}$) BASEEFA CENELEC EN50-020**
- ☐ **Rugged stainless steel construction**
- ☐ **Pressure ranges: 0-75 psi to 10,000 psi (0 - 5 bar to 0 - 700 bar)**
- ☐ **5x overload capacity**
- ☐ **IP67, NEMA 4x rated**
- ☐ **Long term stability 0.1% F.R.O. per annum**
- ☐ **Thermal performance: $< 0.002\%$ F.R.O./°F ($< 0.004\%$ F.R.O./°C)**
- ☐ **Standard, non-IS models are CE certified**

Applications

- ☐ **Hydraulic and pneumatic controls**
- ☐ **Steel and aluminum rolling mills**
- ☐ **Pulp and paper mills**
- ☐ **Automotive test stands**
- ☐ **Power generation**
- ☐ **Off-shore oil exploration**

Select P9000 models, when correctly installed, are CE certified to comply with the EMC Directive 89/336/EEC Generic Standards for Residential, Commercial, Light Industrial and Industrial Environments.



P9000 Series Foil Strain Gauge

Pressure Ranges: 0-75 to 0-10,000 psi
(0-5 to 0-700 bar)

Nonlinearity: $\leq \pm 0.08\%$ F.R.O.

Specifications by Model (All specifications are at 20°C unless otherwise noted)

| Series | P9060 | P9070 | P9080 ¹ |
|---|---------------------|--|----------------------------|
| Model Numbers | P9061/4 | P9071/4 | P9081/4 |
| Input Voltage | 10 to 36 VDC | 15 to 36 VDC | 10 to 36 VDC |
| Current (mA) max | < 6 | < 6 | N/A |
| Output (F.R.O.) | 5 V \pm 0.3% | 10 V \pm 0.3% | 4-20 mA (16 mA \pm 0.3%) |
| Impedance (ohms) | < 1 | < 1 | — |
| Load Resistance (Ohms Min.) | 1000 | 2000 | 1300 max at 36 V |
| Frequency Response | 1 kHz | 1 kHz | 1 kHz |
| Combined Nonlinearity, Hysteresis and Nonrepeatability | | | |
| High Range % F.R.O. (BSL) | $\leq \pm 0.05$ typ | $\leq \pm 0.05$ typ $\leq \pm 0.08\%$ max | $\leq \pm 0.05$ typ |
| Combined Thermal Zero & Sensitivity Error: (calculated from end points of temp. range) | | | |
| The output will not deviate from 20°C by more than 0.5% F.R.O., over a temperature range of -20 to +80°C. | | | |
| % F.R.O./°F | $\leq \pm 0.002$ | $\leq \pm 0.002$ | $\leq \pm 0.002$ |
| % F.R.O./°C | $\leq \pm 0.004$ | $\leq \pm 0.004$ | $\leq \pm 0.004$ |
| Residual Unbalance % F.R.O. | 0 Volts \pm 0.3% | 0 Volts \pm 0.3% | 0 Volts \pm 0.3% |
| Weight oz (gm) max (0001 version) | | | |
| Connector Version | 5.11 (145) | 5.11 (145) | 5.11 (145) |
| Cable Version | 6.35 (180) | 6.35 (180) | 5.64 (160) |

¹Model P9080 is registered as an intrinsically safe transducer to Class ia IIc T4 BASEEFA, Cenelec EN50 - 020.

Common Specifications (all specifications are at 20°C unless otherwise noted)

Pressure Ranges

High psi..... 0-75; 100; 150; 200; 250; 350; 500; 750; 1000; 1500; 2200; 2500; 3500; 5000; 7500; 10,000
bar..... 0-5; 7; 10; 15; 20; 25; 35; 50; 70; 100; 150; 200; 250; 350; 500; 700

Pressure References

High Pressure Range Vented gauge³: 0-75 to 0-350 psi
Absolute and sealed gauge: 0-75 to 0-10,000 psi

Pressure Limit $\geq 5\times$ full range scale pressure or 12,000 psi (830 bar), whichever is less

Burst Pressure $\geq 20\times$ rated pressure range or 22,000 psi (1500 bar), whichever is less

Pressure Media Liquids or gases compatible with 17-4 PH and 17-7 PH stainless steel

Temperature Range

Operable -40°F to 212°F (-40°C to 100°C)

Compensated -4°F to 176°F (-20°C to 80°C)

Storage -40°F to 257°F (-40°C to 125°C)

Humidity

Connector Version 95% Relative Humidity

Cable Version Immersible to IP67 (fluid must not enter ends of cables)

Vibration Surpasses MIL STD 810C Method 514-2 Curve L

Shock 1000g for 2 msec will not damage sensor

Insulation Resistance 500 Mohm at 50 VDC

Long Term Drift $< 0.1\%$ F.R.O./year ($< 0.25\%$ F.R.O. for first 6 months)

EMC CE Approved

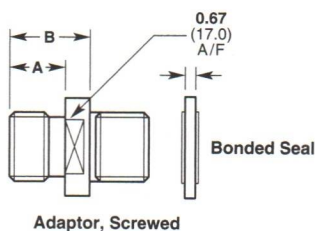
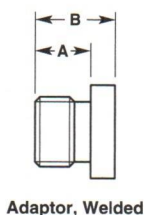
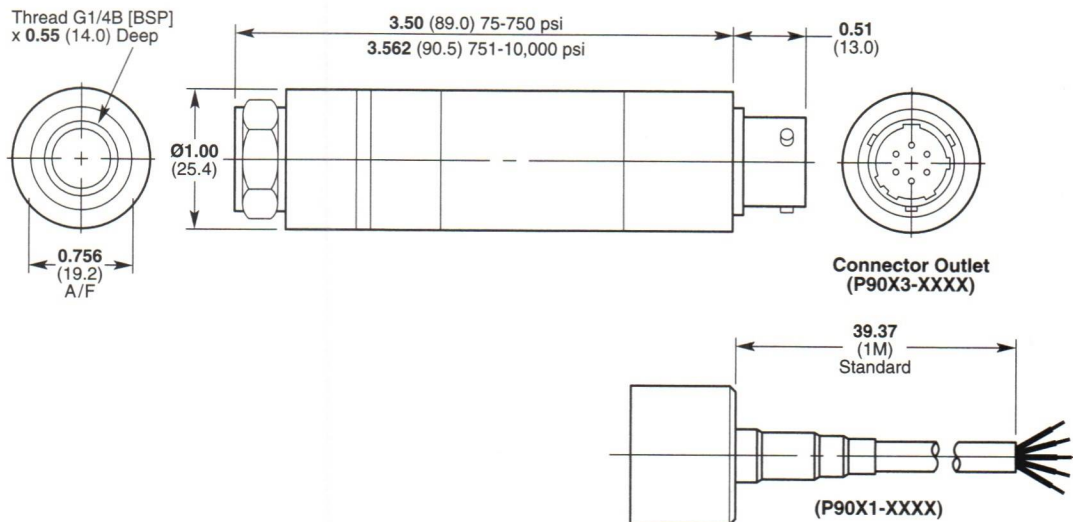
The P9060, P9070 and P9080 Series when correctly installed comply with the EMC Directive 89/336/EEC Generic Standards for Residential Commercial, Light Industrial and Industrial environments. Note: The Industrial environment cannot be complied with when the P9080 series is used in Intrinsic Safety applications where only one earth connection is made.

³ Vented gauge units must only be used in dry, noncorrosive environments and will breathe through the cable vent tube or hole in the 6-way receptacle.

P9000 Series

Advanced Digitally Compensated Pressure Transducer

Dimensions in (mm)



Adapters

| Thread Size | Code | Dimensions in (mm) | |
|--------------------|------|--------------------|-------------|
| | | A | B |
| G1/4A (BSP) (M) | 0002 | 0.46 (11.7) | 0.67 (16.9) |
| M14 x 1.5 (M) | 0003 | 0.40 (10.2) | 0.61 (15.4) |
| 7/16"-20UNF-2A (M) | 0004 | 0.56 (14.3) | 0.77 (19.5) |
| 1/4"-18NPT (M) | 0005 | 0.55 (14.0) | 0.76 (19.2) |
| M10 x 1.0 (F) | 0006 | — | 0.60 (15.2) |

| Thread Size | Code | A | B |
|--------------------|------|-------------|-------------|
| G1/4A (BSP) (M) | 0022 | 0.46 (11.7) | 0.70 (17.8) |
| M14 x 1.5 (M) | 0023 | 0.40 (10.2) | 0.62 (15.8) |
| 7/16"-20UNF-2A (M) | 0024 | 0.56 (14.3) | 0.78 (19.8) |
| 1/4"-18NPT (M) | 0025 | 0.55 (14.0) | 0.80 (20.4) |
| M10 x 1.0 (M) | 0026 | — | 0.60 (15.2) |

Connections

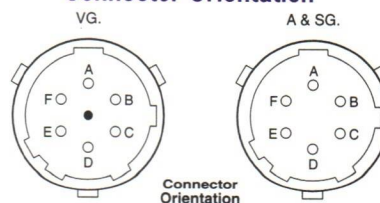
| Cable | Connector** | |
|--------|-------------|------------------|
| Red* | Pin A* | Excitation (+) |
| White | Pin D | Excitation (-) |
| Yellow | Pin B | Output (+) |
| Blue* | Pin C* | Output (-) |
| Violet | Pin E | No connection |
| Grey | Pin F | Factory use only |

Note: Screen is connected to the case for CE marked units. Screen is not connected to the case for optional IS units (P9080). IS certification revokes CE certification.

* 2-wire connections (max cable length 50 meters when IS)

**Vented gauge units must breathe through the receptacle (mating connector must have a vent hole)

Connector Orientation



Select P9000 models, when correctly installed, are CE certified to comply with the EMC Directive 89/336/EEC Generic Standards for Residential, Commercial, Light Industrial and Industrial Environments.



P9000 Series Foil Strain Gauge

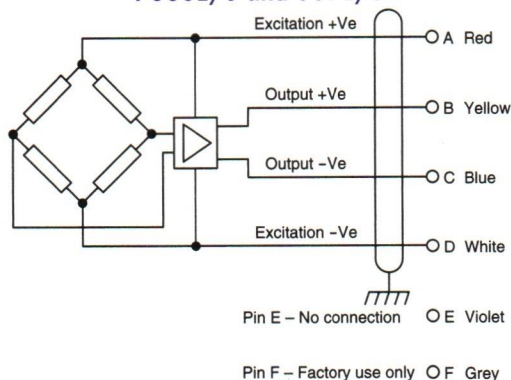
Pressure Ranges: 0-75 to 0-10,000 psi

(0-5 to 0-700 bar)

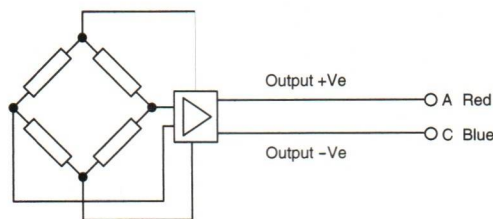
Nonlinearity: $\leq \pm 0.08\%$ F.R.O.

Wiring

P9061/3 and 9071/3



P9081/3



How to Order

Specify by transducer excitation, electrical interface, pressure port, pressure range, units, and pressure reference. Example: P9061-0005-10 BA signifies a pressure transducer with 0 to 5 VDC output operating from 10-36V, cable outlet and 1/4 inch-18 NPT male pressure port, pressure range of 0 to 10 bar, with an absolute pressure reference.

Corrosion resistant pressure transducers are available with wetted parts manufactured from Inconel 625 – consult factory for specifications.

Model Number Code P90 — 0

Input/Output

6 – 0 to 5 V output (10 to 32 V supply)

7 – 0 to 10 V output (15 to 36 V supply)

8 – 4-20 mA output (10-36 V supply)

Cable/Connector

(Please reference to selected pressure range)

1 – High Range – cable outlet

3 – High Range – connector outlet

Intrinsic Safety

0 – Non IS

9 – IS (P9080 only)

Unit

0 – Welded Adapter

2 – Screw in Adapter

Pressure Port

1 – 1/4 in BSP female

2 – 1/4 in BSP male

3 – M14 x 1.5 male

4 – 7/16 in 20 UNF 2A male

5 – 1/4 in 18 NPT male

6 – M10 x 1 female

Unit

B: bar

P: psi

Pressure Reference

A: absolute

S: sealed gauge

V: vented gauge

Pressure Range

(Enter full scale pressure range without units)

High (psi) 0-75; 100; 150; 200; 250; 350; 500; 750; 1000; 1500; 2200; 2500; 3500; 5000; 7500; 10,000

(bar) 0-5; 7; 10; 15; 20; 25; 35; 50; 70; 100; 150; 200; 250; 350; 500; 700

TITAN Series

Low Cost, High Reliability Silicon Pressure Transducer

The Schaevitz® TITAN transducer was developed to meet the most demanding industrial pressure sensing applications while maintaining the lowest possible price. The TITAN's modular building block approach allows for a large number of possible pressure configurations, while maintaining excellent specifications over a wide temperature range of operation. The heart of this building block approach is the custom ASIC, designed specifically for the pressure transducer industry. Utilizing this ASIC allows for field interchangeability, without recalibration of the users system.

The TITAN Series is offered in pressure ranges from 15 psi through 6,000 psi, with five different electrical outputs: 0.5 to 4.5 V (ratiometric); three wire 0.5 to 5.5 V; four wire 0 to 5 V; four wire 0 to 10 V; and two wire 4 to 20 mA. Two types of housing, plastic and stainless steel, are also available. All of the TITAN Series have a non-linearity, hysteresis, and non-repeatability specification of <0.25% FSO, over the temperature range of -25° to 85°C.



Features

- ☐ *Low-cost, modular design based on ASIC technology*
- ☐ *Highly interchangeable*
- ☐ *Plastic and stainless steel housings; IP65/ NEMA 4X protection*
- ☐ *Available in ranges from 15 psi to 6000 psi (1 to 400 bar)*
- ☐ *Outputs available: 0.5-4.5 VDC; 0.5-5.5 VDC; 4-20 mA; 0-5 VDC; 0-10 VDC*
- ☐ *Compensated temperature range from -13°F to 185°F (-25°C to 85°C)*
- ☐ *Standard and custom options available in OEM quantities*

Common Specifications (All specifications are at 77°F (25°C) unless otherwise noted)**Pressure Ranges¹**

| | | |
|----------------------------------|---------------------------------------|---|
| Absolute (psia) | psi: 0 to 15, 30, 50, 100, 250 | bar: 0 to 1, 1.6, 2, 2.5, 4, 6, 7, 10, 15, 16, 25 |
| Vented Gauge (psig) | psi: 0 to 15, 30, 50, 100, 250 | bar: 0 to 1, 1.6, 2, 2.5, 4, 6, 7, 10, 15, 16, 25 |
| Sealed Gauge (psis) | psi: 0 to 500, 1000, 3000, 5000, 6000 | bar: 0 to 35, 40, 60, 70, 100, 205, 250, 350, 400 |

Pressure References Absolute, vented gauge, and sealed gauge (Vented gauge units should only breathe dry, non-corrosive gases, and must breathe through the cable vent tube)

Pressure Limit 0 to 100 psi (0 to 7 bar) 5X the rated pressure
250 to 1,000 psi (15 to 70 bar) 3X the rated pressure
6,000 psi (205 bar) 2.5X the rated pressure

Burst Pressure 0 to 250 psi (0 to 15 bar) 10X the rated pressure
500 to 6,000 psi (35 to 205 bar) 10,000 psi

Media Liquids or gases compatible with 316L stainless steel.

Static Error Band

**Combined Nonlinearity, Hysteresis,
and Nonrepeatability** ±0.25% F.R.O. BSL max.

Temperature Ranges

| | |
|--|-------------------------------|
| Compensated | -13° to 185°F (-25° to 85°C) |
| Operating Media | -40° to 255°F (-40° to 125°C) |
| Operating Electronic Unit | -40° to 185°F (-40° to 85°C) |
| Storage | -58° to 255°F (-50° to 125°C) |

Humidity 95% R.H., noncondensing on all vented gauge units and 100% R.H. condensing on absolute and sealed gauge units.

Vibration 10g Mil-Std-810C, Procedure 514.2, Figure 514.2-2, Curve L.

Shock 50g, 11 msec half sine shock per mil standard 202F, method 213B, condition A

Insulation Resistance 500 Mohms @ 100 VDC per Mil-Std 202F, method 302, condition A.

Long Term Drift ≤0.2% F.R.O./Year Typ.

Response Time <1 msec @ 25°C ± 3.6 Hz/°C

¹For MPA, multiply bar ranges by 0.1

TITAN Series

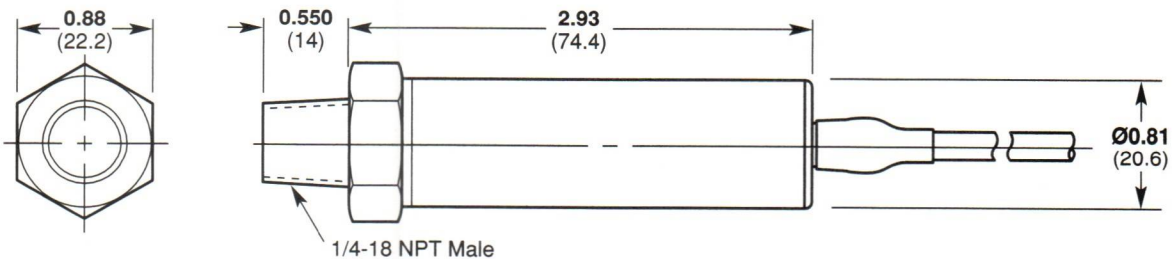
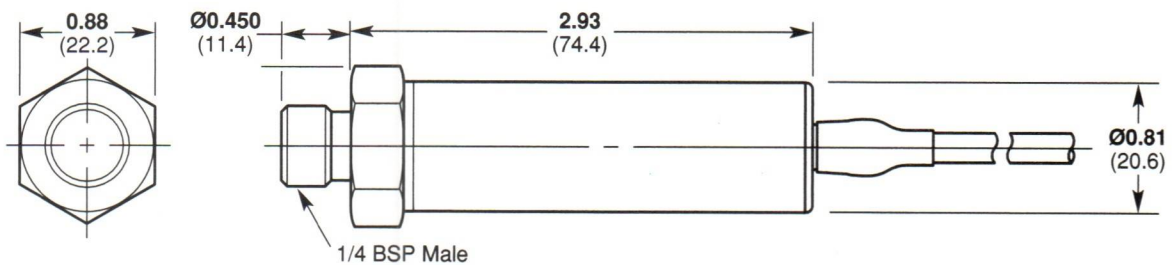
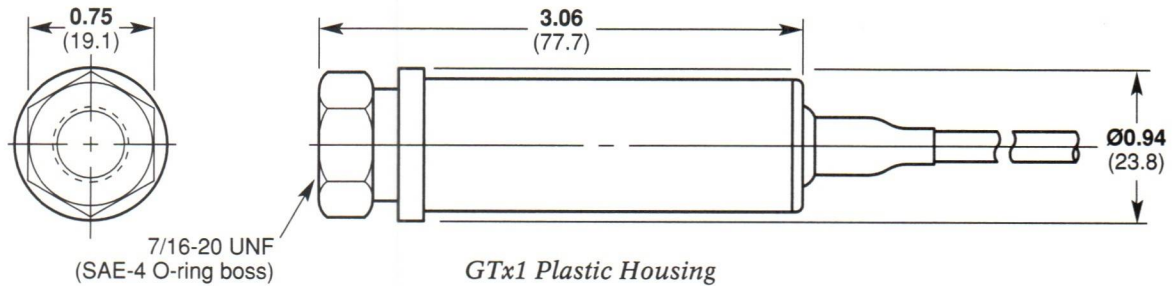
Low Cost, High Reliability Silicon Pressure Transducer

Specifications By Model

| Model Numbers | GT 3 | GT 5 | GT 6 | GT 7 | GT 8 |
|---|---------------|---------------|------------|----------|-------------|
| Output @ 77°F (25°C) F.R.O. | 0.5 - 4.5 VDC | 0.5 - 5.5 VDC | 0 to 5 VDC | 0-10 V | 4 to 20mA |
| Input Voltage (VDC) | 5± 0.25 | 10 to 30 | 10 to 30 | 13-30 | 10 to 30 |
| Input Current (no load) | 4 mA | 5 mA | 5 mA | 5 mA | — |
| Output Impedance (Ohms) | 8 | 5 (max) | 5 (max) | 5 (max) | 1 Meg (min) |
| Output Current Limit (mA) Typ. | 27 | 50 | 50 | 50 | 25 |
| Zero Offset (% F.R.O.) | ±0.25 | 0.5V ±0.25 | 0V ±0.25 | 0V ±0.25 | 4mA ±0.25 |
| Combined Thermal Zero & Sensitivity Error (%F.R.O.)* | 1.5% Max | 1.5% Max | 1.5% Max | 1.5% Max | 1.5% Max |

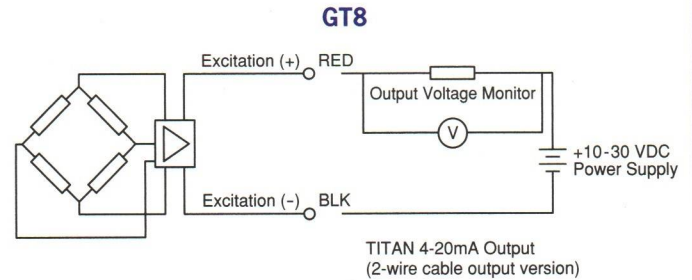
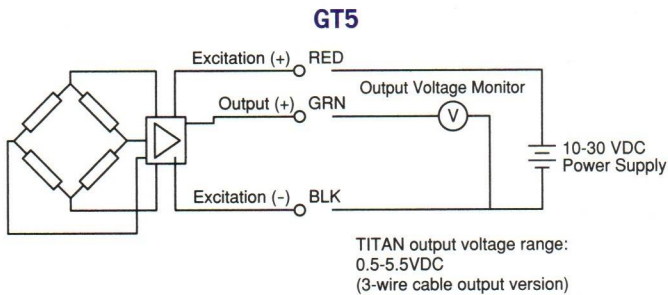
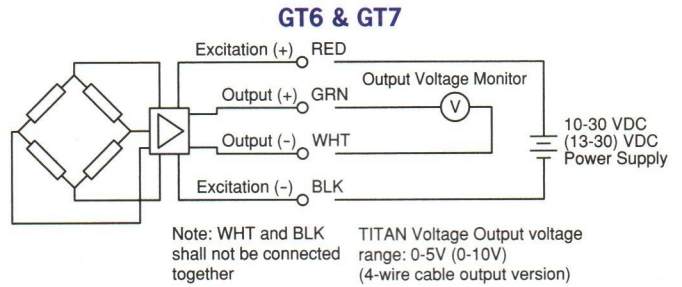
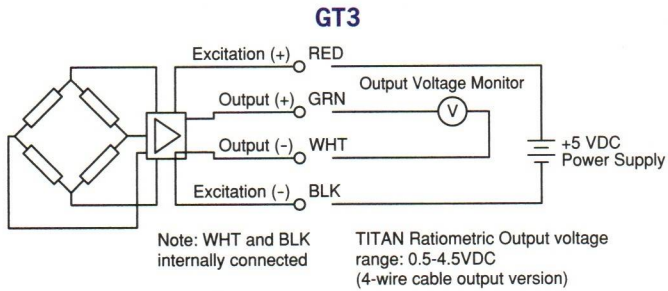
*-25°C to 85°C

Dimensions in (mm)



*Note: Port configurations shown as example only.

Wiring



How to Order

Specify by input/output, cable/connector, pressure port, pressure range, and unit of measure.

Model Number Code:

Input/Output

- 3- 0.5 to 4.5 V output (5 VDC supply)
- 5- 0.5 to 5.5 V output (10-30 VDC supply)
- 6- 0 to 5 V output (10-30 VDC supply)
- 7- 0 to 10 V output (13-30 VDC supply)
- 8- 4 to 20 mA output (10-30 VDC supply)

Connection* /Housing

- 1 - Cable/Plastic housing
- 2 - Cable/Stainless steel housing

*Supplied with 1 meter of cable.

Pressure Port**

- 2 - 1/4 inch BSP male
- 5 - 1/4 inch 18 NPT male
- 7 - 7/16 inch 20 UNF female**
- SAE-4 O-ring boss (MS16142-4)

** Other fittings available upon request; contact factory.

Pressure Range***

(Enter desired pressure value without units)

Psi 15; 30; 100; 250; 500; 1000; 3000; 5000; 6000
Bar 0 to 1; 1.6; 2; 2.5; 4; 6; 7; 10; 15; 16; 25

*** Additional pressure ranges available upon request; contact factory.

Unit

P: psi
B: bar

Pressure Reference

A: Absolute
S: Sealed gauge
V: Vented gauge

Ares Series

PCB Mounted Pressure Transducers for Volume OEM Applications

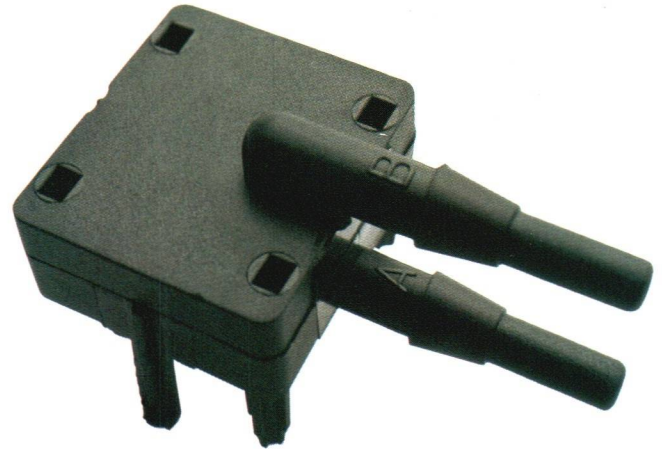
The Ares Series is a small, low cost pressure transducer, which is able to measure pressures as low as 0 to 5, 0 to 10, 0 to 15 inches of water, and 0 to 1 psig. The ranges combined with the small physical size make the device ideally suited for applications such as HVAC, medical equipment and flow monitoring.

The plastic housing design for the Ares Series makes the device very user friendly. The housing is designed to be printed circuit board mountable, requiring no additional hardware. Built into the housing are self locking pins which insure a secure fit between the housing and the PCB. The pressure ports are 3/16" barbed ports which mate with industry standard 1/8" or 3/16" ID tubing. These ports are mounted 90° to the printed circuit board to allow other boards to be located above the sensor.

Providing both error correction and signal amplification, the electronic module's ASIC uses digital compensation while maintaining an analog signal path, a unique design among piezoresistive sensor products. The technique provides the high level of error correction found in microprocessor-based circuits but with a typical bandwidth of >1 kHz generally found only in analog circuits. The result is a pressure sensor that offers the ultimate in low-cost and high accuracy, while preserving the fast response and smooth output inherent to silicon sensors.

The ASIC is a mixed signal CMOS sensor interface that uses differential switched capacitor architecture, and was specifically designed to compensate for the errors associated with piezoresistive silicon sensors.

The heart of the Ares pressure transducer is its custom ASIC. This ASIC, an enhanced version of the ASIC used on the TITAN Series pressure transducer, drastically reduces the external parts requirement for calibration. This development allows the overall PCB size to be reduced, while still allowing the Ares to achieve outstanding performance characteristics. Due to its small size, barbed pressure ports, and solder re-flow capability, the Ares pressure transducer is ideally suited for a wide range of applications.



Features

- ☐ *Very Low Pressure Ranges*
- ☐ *Small Size*
- ☐ *PCB Mountable*
- ☐ *Solder Reflow Capability*
- ☐ *Barbed Pressure Ports*
- ☐ *Dry/Dry Differential Transducer*

Typical Applications

- ☐ *HVAC*
- ☐ *Medical Equipment*
- ☐ *Environmental Controls*
- ☐ *Portable Monitors*

Common Specifications (all specifications are at 77°F [25°C] unless otherwise noted)

| | |
|--|--|
| Supply Voltage | 5V |
| Maximum Proof Pressure to any Port | 5 psi |
| Burst Pressure | 10 psig all ranges |
| Maximum Common Mode Pressure | 10 psi all ranges |
| Media | Non-Ionic, Non-Corrosive media (clean, dry gases) |
| Humidity | 95% non-condensing |
| Shock | 50 g, 11 msec, 1/2 sine per Mil Std 202F, Method 213B, Condition A |
| Vibration | 10 g sinusoidal peak to peak per Mil Std 810C |
| Long Term Drift | ±0.5%FSO/year |
| Reflow Temperature | 240°C (5 sec max) |
| Temperature Range | |
| Compensated | 0° to 60°C |
| Operating | -25° to 80°C |
| Storage | -25° to 80°C |

Specifications by Model

| | GA100 Series | GA200 Series |
|---|--------------|--------------|
| Offset ¹ (V) | 0.5 ±0.050 | 0.25 ±0.050 |
| Span ^{1,3} (V) | 4.0 ±0.025 | 3.75 ±0.025 |
| Input Voltage ³ (V) | 5.0 ±0.25 | |
| Output Impedance (Ω Max) | 5 | |
| Temperature Error (Over the Compensated Range) | | |
| Span Error (%FSO) | 1.5% | |
| Zero Error (%FSO) | 1.5% | |

¹ At 5.00 VDC input voltage.

² Output is ratiometric to input voltage variation.

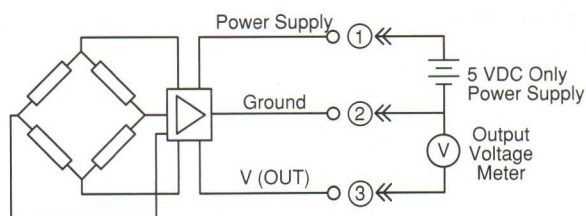
³ The span is defined as the algebraic difference between the electrical output at full scale pressure voltage and the electrical output at zero pressure.

Standard Pressure Ranges

| Ares Model Number | Operating Pressure | Accuracy %FSO ⁴ |
|-------------------|---------------------------|----------------------------|
| GA100-005WD | 0 to 5" H ₂ O | 0.25% |
| GA100-010WD | 0 to 10" H ₂ O | 0.5% |
| GA100-015WD | 0 to 15" H ₂ O | 0.5% |
| GA100-001PD | 0 to 1 PSI | 0.75% |
| GA200-005WD | 0 to 5" H ₂ O | 0.25% |
| GA200-010WD | 0 to 10" H ₂ O | 0.5% |
| GA200-015WD | 0 to 15" H ₂ O | 0.5% |
| GA200-001PD | 0 to 1 PSI | 0.75% |

⁴ Includes effects of non-linearity, hysteresis and repeatability

Output Connection Diagram



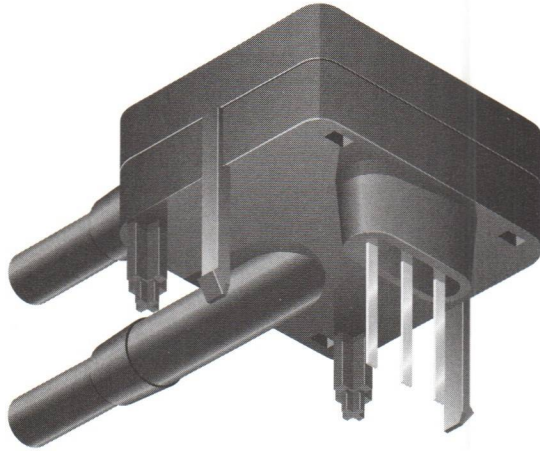
Ares Series

PCB Mounted Pressure Transducers for Volume OEM Applications

How to Order

Specify the Ares model with the appropriate output configuration and pressure range.

Ares Series Pressure Transducer Model Number Code:



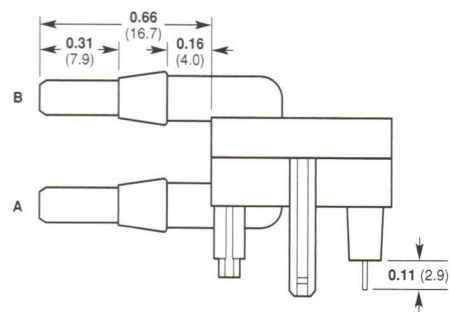
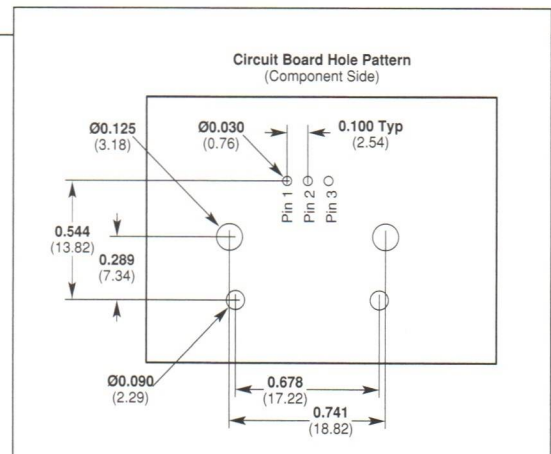
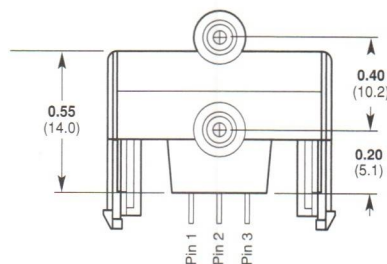
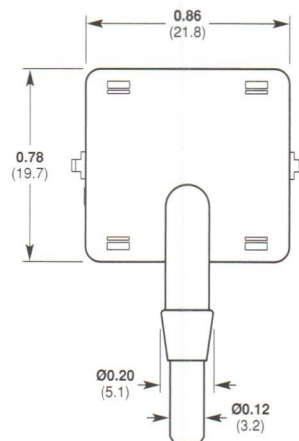
GA

Output Configuration

100 (0.5 to 4.5 V)
200 (0.250 to 4 V)

Pressure Range

005WD (5" H₂O)
010WD (10" H₂O)
015WD (15" H₂O)
001PD (1 psi)



P981-01XX Series

P981-01XX Series

Rolling Mill Series

Schaevitz® Sensors, introduces the P981-01XX media isolated pressure transducer. Designed specifically for harsh environments found in steel and aluminum rolling mill applications. Based on the popular P980 two wire, 4-20mA digitally compensated series, the P981-01XX offers unique features not found on other types of pressure transducers.

The Rolling Mill Series offers an exceptionally fast response rate of 900Hz while maintaining an accuracy of less than $\pm 0.20\%$ F.R.O. The P981-010XX has built-in transient suppressor to eliminate the effects of line voltage transient and is EMC compliant to CE Standards. The pressure transducer has also been fitted with an integral pressure restrictor virtually eliminating the possibility of damage due to high over pressure spikes.

All Schaevitz® high pressure transducers incorporate a proprietary fatigue enhanced diaphragm, which extends long term reliability and reduces degradation caused by a high number of pressure cycles.

Features and Options

- ☐ **2 Wire, 4 to 20mA output**
- ☐ **Transient suppressor to protect against voltage spikes**
- ☐ **Built in pressure restrictor**
- ☐ **1/2" BSP male pressure port**
- ☐ **7/16" - 20 UNF BSP male pressure port**
- ☐ **Bleed screw to eliminate air from the system**
- ☐ **Pressure connector with 'O' ring groove**
- ☐ **Reverse polarity protected**
- ☐ **High overload and burst capabilities**
- ☐ **CE certified**



Specifications

Pressure Ranges

| | |
|-----------|---|
| psi | 1500, 2200, 2500, 3500, 5000, 7500, 10000 |
| bar | 100, 150, 200, 250, 350, 500, 700 |

Pressure Reference Sealed gauge

Pressure Limit $\geq 5x$ rated pressure or 830 bar (12,000 psi) whichever is less

Burst Pressure Limit $\geq 20x$ rated pressure or 22,000 psi (1500 bar) whichever is less

Pressure Media Liquids and gases compatible with 17-4 pH or 17-7 pH stainless steel

Input Supply Voltage 10 to 36 VDC

Residual Unbalance 4mA, $\pm 0.3\%$ F.R.O.

Full Range Output 4 - 20mA (16mA $\pm 0.3\%$ FRO)

Load Impedance (ohms) .. 1625 max @ 36V

Frequency Response 100/900Hz

Combined Non-Linearity, Hysteresis and

Non-Repeatability $< \pm 0.920\%$ F.R.O.

Combined Thermal Zero

and Sensitivity Error $\pm 0.008\%$ F.R.O./°F ($\pm 0.075\%$ FRO/°C)

Temperature Ranges

Compensated -4°F to 176°F (-20°C to 80°C)

Operational -40°F to 212°F (-40°C to 100°C)

Storage -40°F to 257°F (-40°C to 125°C)

Humidity Immersible to IP67

Vibration Surpasses Mil Std 810C Method 514-2 Curve L

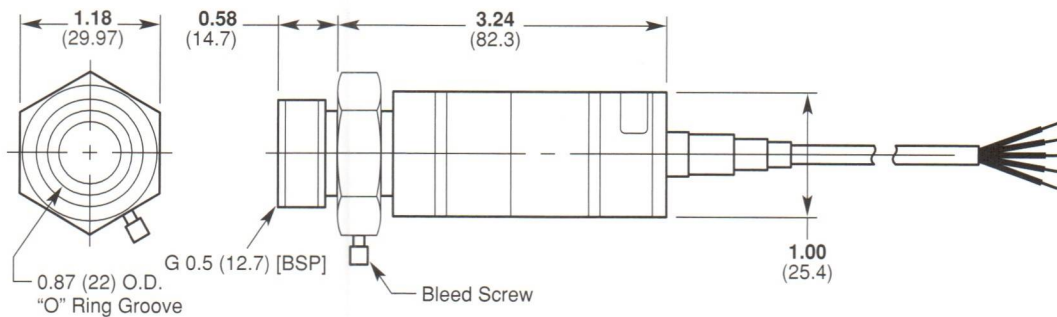
Shock 1000 g's for 2 msec will not damage sensor

Insulation Resistance 500 Mohm at 50 Vdc

Long Term Drift $< 0.1\%$ FRO/year

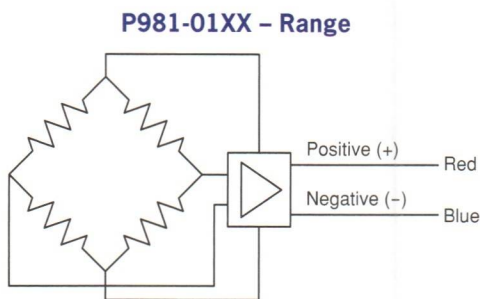
EMC The P980 Series when correctly installed comply with the EMC Directive 89/336/EEC Generic Standards for Residential Commercial, Light Industrial and Industrial environments.

Dimensions in (mm)



Typical dimensions for unit with bleed screw and 1/2" BSP pressure port.

Wiring



Voltage Output Units Available
(See P900 Standard)

How to Order

The P981 Rolling Mill specific pressure transducer can be ordered as shown below. Please use the non-standard part number P981-01XX, and the pressure range required as illustrated below. For cable lengths greater than 1 meter (39.5") please specify required lengths.

Model Number Code:

P981

-

01XX

-



8 4-20 mA Output 10-36 V Supply

1 High Range Cable Output

Rolling Mills Series*

S: Sealed Gauge

Units
P psi
B bar

Pressure Range

| | |
|-----|---|
| Psi | 1500; 2200; 2500; 3500; 5000; 7500; 10000 |
| Bar | 100, 150, 200, 250, 350, 500, 700 |

*Call factory for available pressure port and connector options.

Subsea

Pressure Sensors for Sub-Sea Applications

Today's sub-sea technology employed in the offshore production of oil and gas requires pressure measurement instrumentation combining long term stability, reliability and an operating life in excess of 25 years.

In addressing these market needs, Schaevitz® Sensors has developed a range of type test/qualified Pressure Sensors for operation both inside Sub-Sea Control Modules and for installation directly on Sub-Sea Production Manifolds and Xmas Trees.

Within the offshore industry Schaevitz® participation began in 1981-2 supplying Schaevitz® Sub-Sea Pressure Transmitters for production platform launch and positioning

systems to Marathon Oil for Brae 'A' and Brae 'B', Elf Aquitaine, Norge for Heimdal and to B.P. Norway for the U.L.A. platforms. During this period the P480 series potential was realized for sub-sea use, on production manifolds to measure process and water injection pressures.

A.C.B. France evaluated the P480 series alongside other manufacturers sensors on the SKULD diverless installed production manifold. From the results of their evaluation the Schaevitz® range of Sub-Sea Pressure Transmitters were selected for Elf Aquitaine, Norge's – East Frigg and Totals – North Alwyn systems.

Subsea P480/PX480 Series

Wellhead Pressure Transmitters

The P480 Series is designed for direct installation on subsea oil production manifolds to measure oil/gas process and water injection pressures. Integral 2 wire transmission provides 4-20mA signals via customer specified cable or subsea mateable connector assemblies back to the control system.

Manufactured from high corrosion resistant alloys to meet NACE and other requirements, the sensor and casing is of electron beam and T.I.G. welded construction, hyperbarically tested, ensuring reliable operation to depths of 2500 metres with an operating life in excess of 25 years. In the unlikely event of the pressure diaphragm rupturing, secondary containment is provided within the pressure capsule to 11,600 psi (800 bar). As a mandatory requirement, an additional containment (tertiary) has been added which is pressure tested and verified to 15,000 psi (1035 bar) on each unit during manufacture.

Features

- ❑ ***Designed for long term seawater immersion to depths of 8,000 ft (2500 meters)***
- ❑ ***Pressure connection API. 6A or 17D. Process Flange manufactured from Duplex, Super Duplex (BX ring with Inconel 625 inlay optional)***
- ❑ ***Designed to API requirement PR1; product specification Level PSL3 and suitable for class of service up to and including API. Class 'F'***
- ❑ ***Dual output and dual redundant options***
- ❑ ***Operational life in excess of 25 years***
- ❑ ***Verifiable pressure containment system to 15,000 psi (1035 bar)***
- ❑ ***High over-range capability***
- ❑ ***Electrical termination via. customer specified cable penetrator or subsea connector***



- ❑ ***Low profile "Flush Diaphragm" versions available for applications where waxing and hydrate formation is a possibility***

Field Proven

Pressure Ranges from 1,500 to 15,000 psi (100 to 1035 bar)
Accuracy <±0.1% FRO
Flush diaphragm versions available

SCHAEVITZ
SENSORS

Subsea PTX480 Series

Sub-Sea Wellhead Pressure/Temperature Transmitter

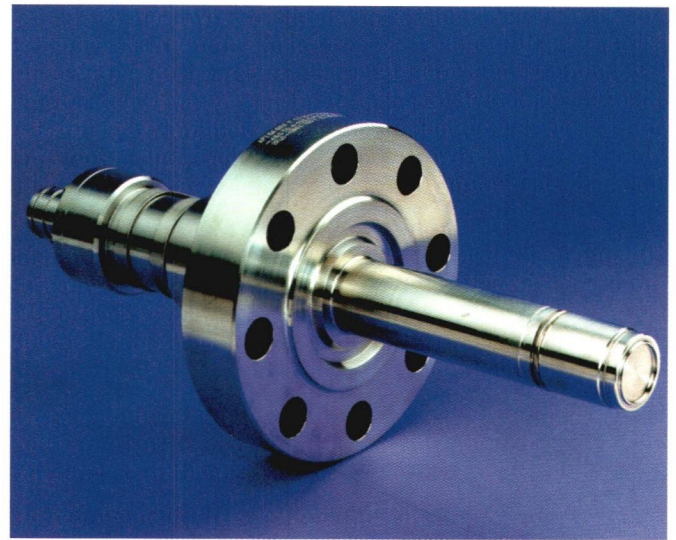
The PTX480 Series provides two measurements at one location. It's design is based on the 'field proven' P480 series but supplied with a flush pressure diaphragm situated adjacent to a temperature sensor at the end of it's thermowell nose. Integral amplifiers provide independent 2 wire 4 to 20 mA outputs for each measurement via customer specified subsea mateable connector or cable penetrator.

To meet the mandatory requirements for equipment installed on subsea production manifolds, the PTX480 design provides a process containment system which is verified to 15,000 psi (1035 bar) on each unit during manufacture.

High overvoltage capability of the PTX480 enables the manifold/tree to be pressure tested with the transmitter installed without damage to the pressure capsule.

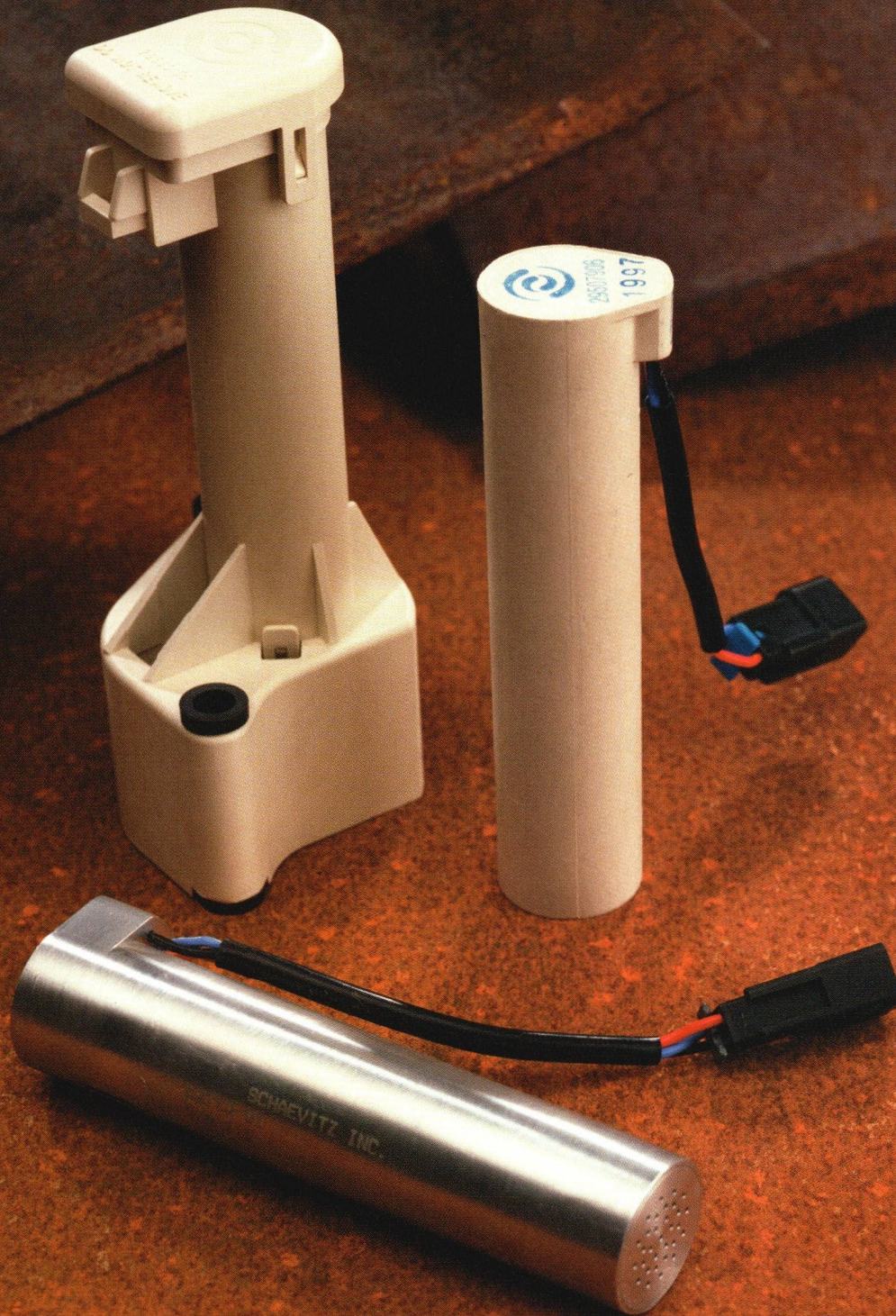
Designed to API requirement PR1; Product Specification Level PSL3 and suitable for class of service up to and including API Class F the PTX480 casing is manufactured from high corrosion resistant Duplex Stainless Steel for sea water immersion to 8,000 ft (2500 meters) with an operational life in excess of 25 years.

Pressure Ranges from 1,500 to 10,000 psi (100 to 700 bar)
Temperature Ranges from -40°F to 272°F (-40°C to 150°C)
Accuracy $\leq \pm 0.10\%$ FRO



Features

- ❑ *Flush diaphragm pressure capsule to eliminate the risk of waxing and hydrate formation impairing the performance of the sensor*
- ❑ *A.P.I. 6A or 17D. Process flange manufactured from Duplex, Super Duplex or 17-4 PH. Stainless steel (BX ring with Inconel 625 inlay optional)*
- ❑ *Designed for long term, seawater immersion to depths of 8,000 ft (2500 meters)*
- ❑ *Pressure containment system verified to 15,000 psi (1035 bar)*
- ❑ *Designed to API requirement PR1; product specification Level PSL3 and suitable for class of service up to and including API. Class 'F'*



*Fluid
Level Sensors*

AccuStar

Fluid Level Sensors



Schaevitz® Sensors announces an innovative fluid level sensor for the most restrictive and harshest environments. Custom designed for each application, fluid level sensors are ideal for use in:

Applications

- ☐ *Truck, automotive, marine, and off-highway vehicles engines*
- ☐ *Transmissions*
- ☐ *Industrial speed reducers*
- ☐ *Hydraulic reservoirs*
- ☐ *Air compressors*
- ☐ *Turbine engines*
- ☐ *Generators*

Engineering Principle

Major components of the AccuStar Fluid Level Sensor are the housing, float, springs, a samarium cobalt magnet, and the Hall Effect sensor. The springs attach the float to the outside housing through three helical leaves. The spring rate of the helical springs is relatively low in an axial direction. However, they are very stiff in a radial direction. This prevents the float from making contact with the outside housing.

Another unique feature of the design is the capability to calibrate the sensor to best meet the operating parameters of each application. Calibrations include trimming the strength of the magnet to provide the correct output for the specific fluid level conditions being measured. With the addition of selected resistors on the printed circuit board we are also able to calibrate for mechanical tolerances, buoyancy of the float, and tolerances associated with the Hall Effect device. Gain and null adjusts on the chip itself enable us to further trim and customize the sensor to your application.

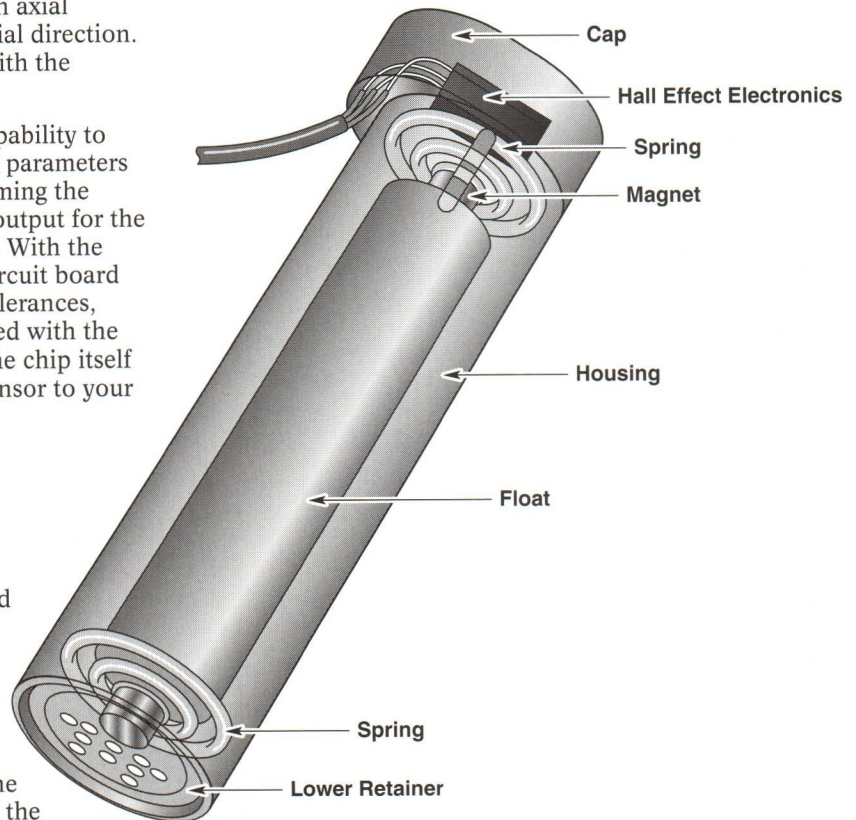
How It Works

The heart of the sensor is a uniquely suspended float element whose buoyancy causes slight relative motion. This small movement of the magnet-topped float, in relationship to a Hall Effect device, provides a definitive indication of fluid level with exceptional repeatability.

The electronics (Hall Effect) are mounted in the top of the housing, approximately 0.150" from the cobalt magnet, which is secured to the top of the float. The float is suspended within the mounting tube by a pair of springs, top and bottom. The springs, which are rigid radially, but relatively flexible longitudinally, position the float and allow smooth movement without the usual stiction, hysteresis, and wear associated with conventional float sensors. (The AccuStar Fluid Level Sensor can be adapted to a wide range of measurement requirements by changing the spring constants and lengthening the float and mounting tube.)

Fluid enters through a series of intake holes in the bottom of the sensor. The hole diameters are sized smaller than the float to housing clearance so that the largest foreign particles to enter the sensor will not jam the float or cause "stiction." Slots near the top of the sensor allow air to escape as fluid rises. The slots are positioned so as to maintain an air bubble around the magnet at the maximum stroke distance of the float. This is an added security measure to prevent any magnetic particles present in the fluid from contaminating the magnet.

As fluid enters the bottom of the sensor the float moves axially toward the Hall Effect device. The result is an output signal proportional to the fluid level. The DC voltage output is about 1 volt at empty and 4 volts at full. Throughout this range, the relative motion of the float is just 0.070" in either direction.



Benefits

- ❑ **Prevent damage to vehicles/equipment caused by low fluid levels. Automatic shutdown or reduced vehicle/equipment capability could be accomplished through a control system using the output from the AccuStar Fluid Level Sensor (limit rpm, allowed transmission ranges, hydraulic pressures, etc.)**
- ❑ **Fluid levels can be monitored and stored in memory and retrieved at a later date to provide information useful in developing fluid level consumption. This information could also be used in determining warranty coverage on equipment or machinery.**
- ❑ **Reduced time required to check the fluid levels of vehicles**

AccuStar

Fluid Level Sensor

Simple • Rugged • Patented • Operates in harsh environments • OEM design flexibility. . .

it all adds up to a new concept in fluid level sensing. Call Schaevitz® Sensors and let us work out a specific design proposal for your applications.

Features

- ☐ ***Electronic device provides a definitive indication of fluid level***
- ☐ ***Accurately measures fluid levels under static and dynamic conditions***
- ☐ ***Measures fluid density, therefore, fluid may be either hot or cold. Eliminates the need for temperature compensation in order to get an accurate level reading***
- ☐ ***Will operate at temperatures of 150°C (302°F)***
- ☐ ***Replaces less capable thermistors and reed switches***
- ☐ ***Patented design. Simple, rugged, and reliable!***
- ☐ ***Cost effective. Can save thousands in premature repair costs resulting from operating at low oil levels.***
- ☐ ***Easily customized to fit into a wide range of application possibilities***

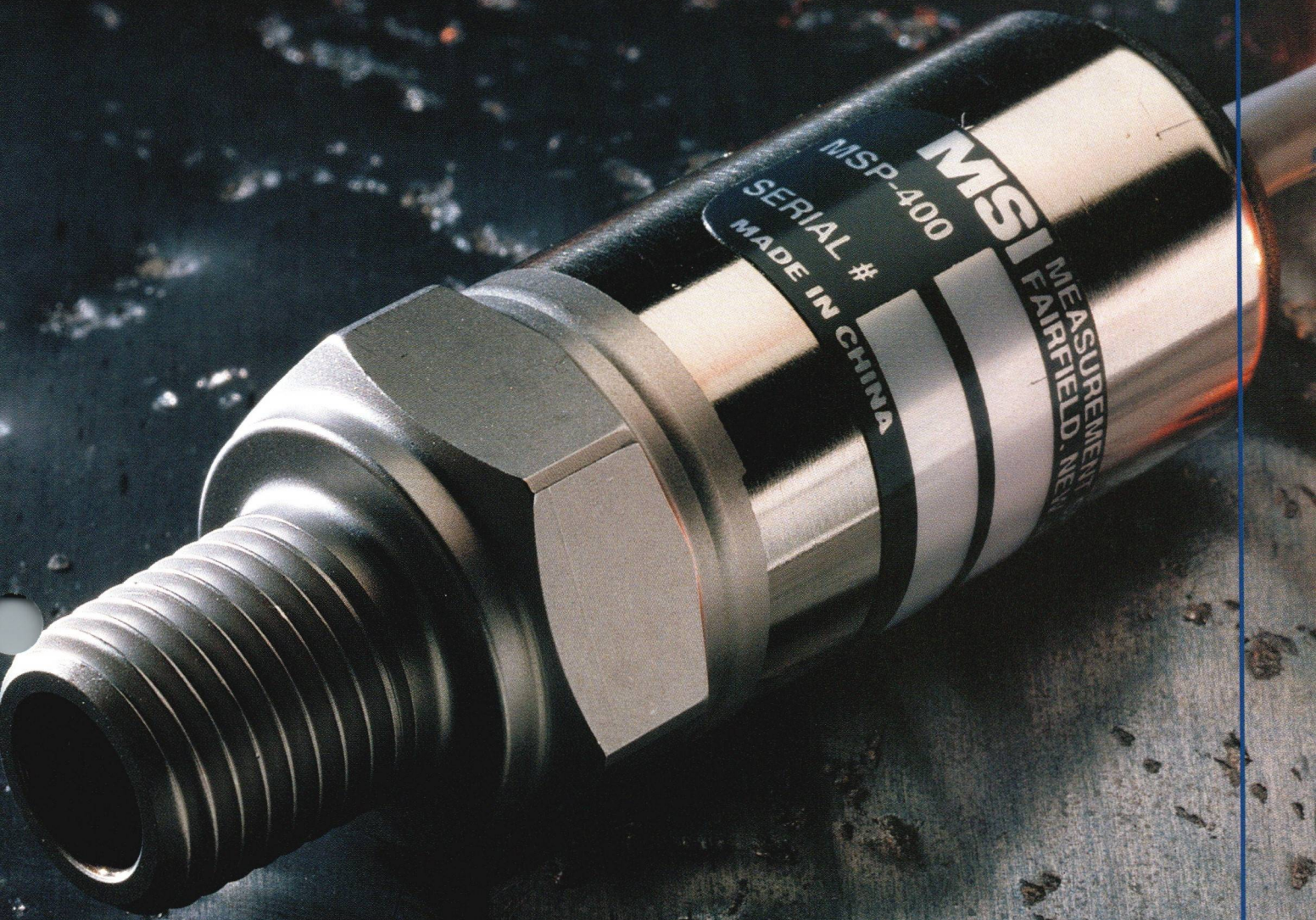
Specifications

| | |
|---------------------------|---|
| Repeatability | ±3 mm |
| Output | Ratiometric analog |
| Power | 5 VDC |
| Operating Temperature ... | 150°C (302°F) Excursions to 165°C (329°F) |
| Case | Liquid crystal polymer |
| Size | Model shown here 4.5" length, 1.125" dia. (Adaptable to your application requirements.) |

How to Order

Consult factory for your particular application.

**MSP Series
Pressure Sensors**



Measurement Specialties
Microfused Technology

MSP-300 Stainless Steel Isolated Pressure Transducer

- **Low Cost OEM**
- **100% Media Leak |**
No "O" Rings, No Silicone Oil,

Features

One-piece Stainless Steel Construct
Ranges up to 10,000 PSI or 700 B
Millivolt or Amplified Outputs
Excellent Accuracy
Wide Operating Temperature Range

Applications

Pumps and Compressors
Hydraulic/Pneumatic Systems
Automotive Test Systems
Energy and Water Management
Pressure Instrumentation
Refrigeration — Freon and Ammon
Agriculture — Sprayers and Dusters

Description

The MSP series pressure transducers set a new price-performance standard for low cost, high volume, commercial and industrial applications. This series is suitable for measurement of liquid or gas pressure, even for difficult media such as contaminated water, steam, and mildly corrosive fluids or gases.

The transducer pressure cavity is machined from a solid piece of 17-4 PH stainless steel. The standard version includes a 1/4 NPT pipe thread allowing a leak-proof, all metal sealed system. There are no o-rings, welds or organics exposed to the pressure media. The durability is excellent.

Measurement Specialties proprietary Microfused technology, derived from demanding aerospace applications, employs micromachined silicon piezoresistive strain gages, fused with high temperature glass to a stainless steel diaphragm. This approach achieves media compatibility simply and elegantly providing an exceptionally stable sensor without the p-n junctions of conventional micromachined sensors.

This product is geared to the OEM customer using medium to high volumes. The standard version is suitable for many applications, but the dedicated design team at our Transducer Engineering Center stands ready to provide a semi-custom design where the volume and application warrants.



SPECIFICATIONS

Performance at 77°F (25°C):

| | |
|---|--|
| Pressure range | 0 to 100, 250, 500, 1000, 2500, 5000, 10000 PSI (0 to 7, 17, 35, 70, 175, 350, 700 BAR) |
| Accuracy (combined linearity, hysteresis and repeatability) | < 1% of FS (for higher accuracy consult factory) |
| Media compatibility | 17-4 PH stainless steel (for other material consult factory) |
| Pressure ports | 1/4" NPT (for other ports consult factory) |
| Pressure cycles | >10 ⁸ full pressure cycles |
| Pressure overload | 2X rated pressure |
| Burst pressure | 5X or 20000 PSI whichever is less |
| Long term stability (1 year) | ± 0.25% FS (Typical) |

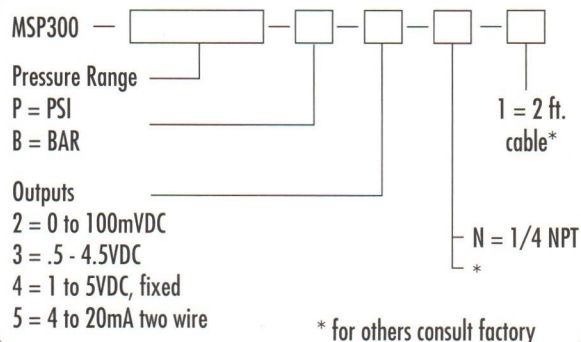
Electrical:

| | | |
|------------------|--|---|
| Supply voltage | 5VDC | 10-30VDC |
| Supply current | <10mA | <15mA |
| Outputs | 0-100mVDC, ratiometric to supply (2) 0.5-4.5VDC, ratiometric to supply (3) | 1-5VDC, fixed (4) 4-20mA, two wire (5) |
| Interface | 2 ft. PVC jacketed cable (for other options consult factory) | |
| Zero offset | ± 3% of FS for 0-100mV / ±2% for amplified (for tighter tolerances consult factory) | |
| Span tolerance | ± 2% of FS (for tighter tolerances consult factory) | |
| Output load | 1M Ohm for millivolt output / 5K Ohm min for high level voltage 0 Ohms @ 10V (1100 Ohms @ 30V) for 4-20mA | |
| Noise | < 2mVRMS - for amplified | |
| Bandwidth (-3dB) | DC to 1KHz - for amplified | |

ENVIRONMENTAL

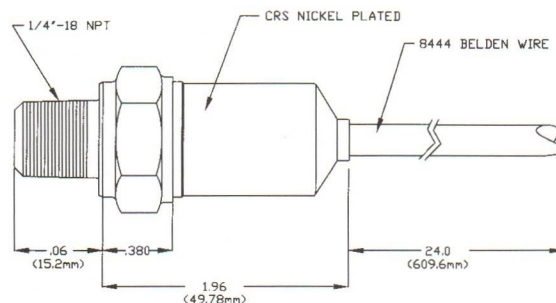
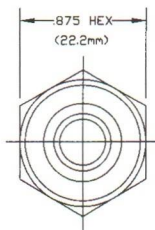
| | |
|-------------------------------|---|
| Operating temperature range | -4 to 185°F (-20 to 85°C), (For other temperature ranges consult factory) |
| Compensated temperature range | 30 to 130°F (0 to 55°C) |
| Zero thermal error | < ± 2% of FS |
| Span thermal error | < ± 2% of FS |
| Storage temperature range | -40 to 185°F (-40 to 85°C) |
| Shock | 50g, 11msec half sine shock per MIL standard 202F, method 213B, condition A |
| Vibration | ±20g MIL-STD-810C, Procedure 514.2, Figure 514.2-2, curve L |

ORDERING



Electrical Connections:

| Outputs: | 2 | 3/4 | 5 |
|----------|---------|--------------|--------------|
| Red | +Supply | Red +Supply | Red +Supply |
| Black | -Supply | Black Ground | Black Output |
| White | -Output | White Output | |
| Green | +Output | | |



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P/N: 2001312 10/00

MSP-310

Stainless Steel Isolated Pressure Transducer With Temperature Output



**ISO
9002**

- **Low Cost OEM**
- **100% Leak Proof**
No "O" Rings, No Silicone Oil

Features

Rugged, Reliable, Low Cost
One-piece Stainless Steel Construction
Ranges up to 10,000 PSI or 700
Pressure and Temperature Output
Excellent Accuracy
Wide Operating Temperature Range

Applications

Pumps and Compressors
Hydraulic/Pneumatic Systems
Off Road
Energy and Water Management
Pressure Instrumentation
CNG (compressed natural gas)
Transmissions

Description

The MSP series pressure transducers set a new price-performance standard for low cost, high volume, commercial and industrial applications. This series is suitable for measurement of liquid or gas pressure, even for difficult media such as contaminated water, steam, and mildly corrosive fluids or gases.

The transducer pressure cavity is machined from a solid piece of 17-4 PH stainless steel. The standard version includes a 1/4 NPT pipe thread allowing a leak-proof, all metal sealed system. There are no o-rings, welds or organics exposed to the pressure media. The durability is excellent.

Measurement Specialties proprietary Microfused technology, derived from demanding aerospace applications, employs micromachined silicon piezoresistive strain gages, fused with high temperature glass to a stainless steel diaphragm. This approach achieves media compatibility simply and elegantly providing an exceptionally stable sensor without the p-n junctions of conventional micromachined sensors.

This product is geared to the OEM customer using medium to high volumes. The standard version is suitable for many applications, but the dedicated design team at our Transducer Engineering Center stands ready to provide a semi-custom design where the volume and application warrants.



SPECIFICATIONS

Performance at 77°F (25°C):

| | |
|---|--|
| Pressure range | 0 to 100, 250, 500, 1000, 2500, 5000, 10000 PSI (0 to 7, 17, 35, 70, 175, 350, 700 BAR) |
| Accuracy (combined linearity, hysteresis and repeatability) | < 1% of FS (for higher accuracy consult factory) |
| Media compatibility | 17-4 PH stainless steel (for other material consult factory) |
| Pressure ports | 1/4" NPT (for other ports consult factory) |
| Pressure cycles | >10 ⁸ full pressure cycles |
| Pressure overload | 2X rated pressure |
| Burst pressure | 5X or 20000 PSI whichever is less |
| Long term stability (1 year) | ± 0.25% FS (Typical) |

Temperature

| | |
|--------|---------------------------------|
| Output | 10mV/°K (2.98V nominal, @ 25°C) |
|--------|---------------------------------|

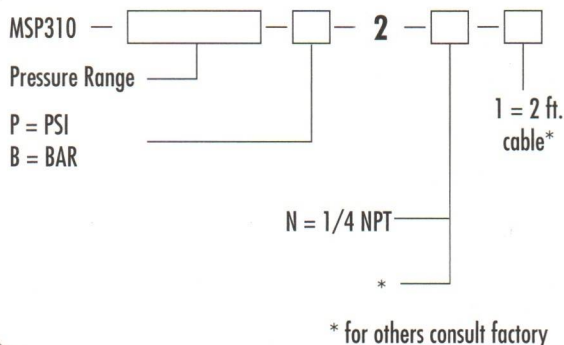
Electrical:

| | |
|------------------|--|
| Supply voltage | 5VDC |
| Supply current | <10mA |
| Output | 0-100mVDC, ratiometric to supply |
| Interface | 2 ft. PVC jacketed cable (for other options consult factory) |
| Zero offset | ± 3% of FS |
| Span tolerance | ± 2% of FS |
| Output load | 1M Ohm |
| Bandwidth (-3dB) | DC to 1KHz min |

ENVIRONMENTAL

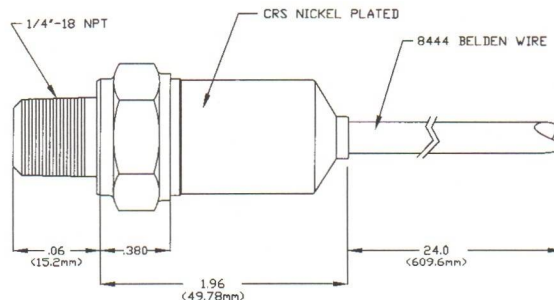
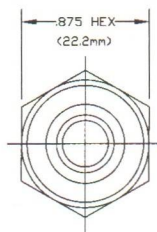
| | |
|-------------------------------|---|
| Operating temperature range | -4 to 185°F (-20 to 85°C), (For other temperature ranges consult factory) |
| Compensated temperature range | 30 to 130°F (0 to 55°C) |
| Zero thermal error | < ± 2% of FS |
| Span thermal error | < ± 2% of FS |
| Storage temperature range | -40 to 185°F (-40 to 85°C) |
| Shock | 50g, 11msec half sine shock per MIL standard 202F, method 213B, condition A |
| Vibration | ±20g MIL-STD-810C, Procedure 514.2, Figure 514.2-2, curve L |

ORDERING



Electrical Connections:

| | |
|-------|--------------------|
| Red | +Supply |
| Black | -Supply |
| White | -Output |
| Green | +Output |
| Brown | Temperature output |



UNITED STATES
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Valley Forge, PA 19482
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Email: sensors@msiusa.com
Web site: www.msiusa.com

M
MEASUREMENT
SPECIALTIES

MSP-320 **Stainless Steel Isolated Low Pressure** **Transducer**

ISO
9002

- **Low Cost OEM**
- **100% Leak Proof**
No "O" Rings, No Silicone (

Features

One-piece Stainless Steel Constr
Ranges 0-25 to 75 PSI

0-1.5 to 6 BAR

Amplified Outputs, 1-5v or 4-20

Excellent Accuracy

Wide Operating Temperature Ra

Applications

Pneumatic Systems

Automotive Test Systems

Energy and Water Management

Pressure Instrumentation

Refrigeration — Freon and Amm

Diesel Fuel Management

Tank Level Metering

Description

The MSP series pressure transducers set a new price-performance standard for low cost, high volume, commercial and industrial applications. This series is suitable for measurement of liquid or gas pressure, even for difficult media such as contaminated water, steam, and mildly corrosive fluids or gases.

The transducer pressure cavity is machined from a solid piece of 17-4 PH stainless steel. The standard version includes a 1/4 NPT pipe thread allowing a leak-proof, all metal sealed system. There are no o-rings, welds or organics exposed to the pressure media. The durability is excellent.

Measurement Specialties proprietary Microfused technology, derived from demanding aerospace applications, employs micromachined silicon piezoresistive strain gages, fused with high temperature glass to a stainless steel diaphragm. This approach achieves media compatibility simply and elegantly providing an exceptionally stable sensor without the p-n junctions of conventional micromachined sensors.

This product is geared to the OEM customer using medium to high volumes. The standard version is suitable for many applications, but the dedicated design team at our Transducer Engineering Center stands ready to provide a semi-custom design where the volume and application warrants.



SPECIFICATIONS

Performance at 77°F (25°C):

| | |
|---|--|
| Pressure range | 0-25, 50, 75 PSI, (consult factory for compound ranges) 0-1.5, 3.0, 6 BAR |
| Accuracy (combined linearity, hysteresis and repeatability) | < 1% of FS Span (for higher accuracy consult factory) |
| Media compatibility | 17-4 PH stainless steel (for other material consult factory) |
| Pressure ports | 1/4" NPT (for other ports consult factory) |
| Pressure cycles | >10 ⁸ full pressure cycles |
| Pressure overload | 2X rated pressure |
| Burst pressure | 10 times or 500 PSI whichever is less |
| Long term stability (1 year) | ± 0.50% FS Span, (Typical) |

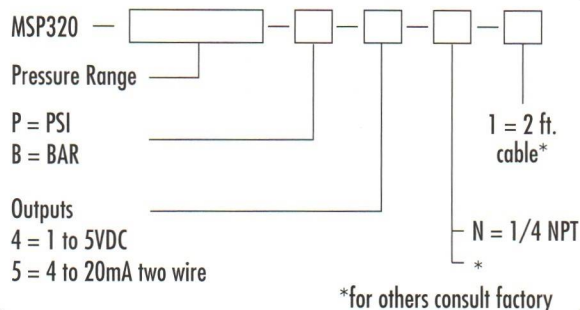
Electrical:

| | |
|------------------|--|
| Supply voltage | 10-30VDC |
| Supply current | <15mA max |
| Outputs | 1-5VDC, fixed (4) 4-20mA two wire (5) |
| Interface | 2 ft. of PVC jacketed cable (for other options consult factory) |
| Zero offset | ± 2% of FS span |
| Span tolerance | ± 2% of FS span |
| Output load | 5K Ohm (min) for high level voltage 0 Ohms @ min 10V (1100 Ohms @ 30V) for 4-20mA |
| Noise | < 2mVRMS |
| Bandwidth (-3dB) | DC to 1KHz (Typical) |

ENVIRONMENTAL

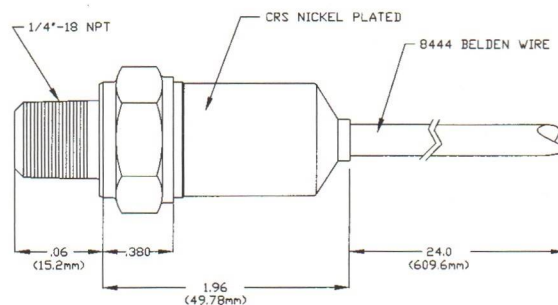
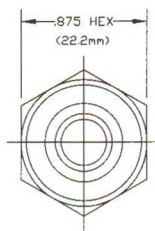
| | |
|-------------------------------|---|
| Operating temperature range | -4 to 185°F (-20 to 85°C), (For other temperature ranges consult factory) |
| Compensated temperature range | 30 to 130°F (0 to 55°C) |
| Zero thermal error | < ± 2% of FS Span |
| Span thermal error | < ± 2% of FS Span |
| Storage temperature range | -20 to 185°F (-30 to 85°C) |
| Shock | 50g, 11msec half sine shock per MIL standard 202F, method 213B, condition A |
| Vibration | ±20g MIL-STD-810C, Procedure 514.2, Figure 514.2-2, curve L |

ORDERING



Electrical Connections:

| | | | |
|-----------------|----------|-------|----------|
| Outputs: | 4 | | 5 |
| Red | +Supply | Red | +Supply |
| Black | Ground | Black | Output |
| White | Output | | |



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P/N: 2001314 10/00

M
MEASUREMENT
SPECIALTIES



MEASUREMENT
SPECIALTIES

- No Leaks
- No Welds
- No "O" Rings
- No Silicone Oil

Microfused Technology

MSP-400 EMI/RFI Protected Stainless Steel Isolated Pressure Transducer

ISO
9002

- Low Cost OEM
- 100% Leak Proof

Features

One-piece Stainless Steel Construction
Ranges up to 10,000 PSI or 700 BAR
Amplified Outputs
Excellent Accuracy
Wide Operating Temperature Range

Applications

Pumps and Compressors
Hydraulic/Pneumatic Systems
Off Road
Energy and Water Management
Pressure Instrumentation
Refrigeration Equipment
Agriculture Equipment
Train Braking Systems

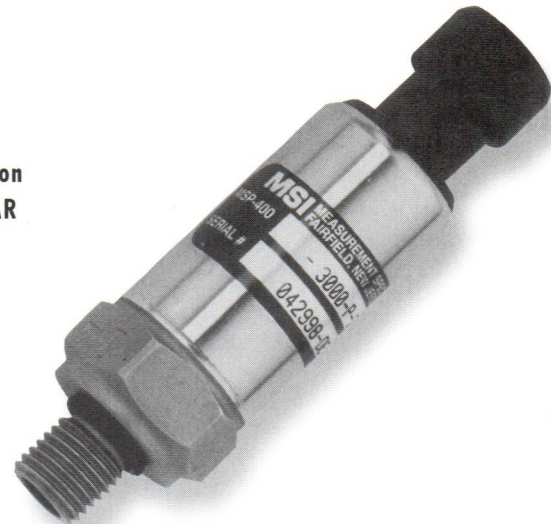
Description

The MSP series pressure transducers set a new price-performance standard for low cost, high volume, commercial and industrial applications. This series is suitable for measurement of liquid or gas pressure, even for difficult media such as contaminated water, steam, and mildly corrosive fluids or gases.

The transducer pressure cavity is machined from a solid piece of 17-4 PH stainless steel. The standard version includes a 1/4 NPT pipe thread allowing a leak-proof, all metal sealed system. There are no o-rings, welds or organics exposed to the pressure media. The durability is excellent.

Measurement Specialties proprietary Microfused technology, derived from demanding aerospace applications, employs micromachined silicon piezoresistive strain gages, fused with high temperature glass to a stainless steel diaphragm. This approach achieves media compatibility simply and elegantly providing an exceptionally stable sensor without the p-n junctions of conventional micromachined sensors.

This product is geared to the OEM customer using medium to high volumes. The standard version is suitable for many applications, but the dedicated design team at our Transducer Engineering Center stands ready to provide a semi-custom design where the volume and application warrants.



SPECIFICATIONS

Performance at 77°F (25°C):

| | | |
|---|--|--|
| Pressure range | 0 to 100, 250, 500, 1000, 2500, 5000, 10000 PSI (consult factory for compound ranges) (0 to 7, 17, 35, 70, 175, 350, 700 BAR) | |
| Accuracy (combined linearity, hysteresis and repeatability) | ± .5% of FS Span (for higher accuracy consult factory) | |
| Media compatibility | 17-4 PH stainless steel (for other material consult factory) | |
| Pressure ports | 1/4" NPT (for other ports consult factory) | |
| Pressure cycles | >10 ⁸ full pressure cycles | |
| Pressure overload | 2X rated pressure | |
| Burst pressure | 5X or 20000PSI whichever is less | |
| Long term stability (1 year) | ± 0.25% FS Span (typical) | |

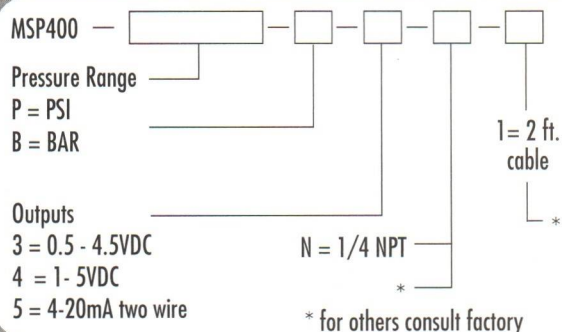
Electrical:

| | | |
|------------------|--|--|
| Supply voltage | 5VDC | 10-30VDC |
| Supply current | <10mA | <15mA |
| Outputs | 0.5 - 4.5VDC, ratiometric to supply (3) | 1-5VDC, fixed (4) 4-20mA two wire (5) |
| Interface | 2 ft PVC jacketed cable (for other options consult factory) | |
| Zero offset | ± 2% of FS Span (for tighter tolerances consult factory) | |
| Span tolerance | ± 2% of FS Span (for tighter tolerances consult factory) | |
| Output load | 5K Ohm (min) for high level voltage 0 Ohms @ 10V (1100 Ohms @ 32V) for 4-20mA | |
| Noise | < 2mVRMS | |
| Bandwidth (-3dB) | DC to 1KHz (Typical) | |

ENVIRONMENTAL

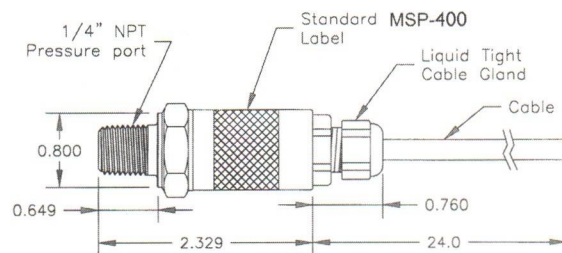
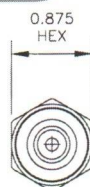
| | |
|-------------------------------|---|
| Operating temperature range | -40° to 185°F (-40 to 85°C), (For other temperature ranges consult factory) |
| Compensated temperature range | 30 to 158°F (0 to 70°C) |
| Zero thermal error | < ± 1.5% of FS Span |
| Span thermal error | < ± 1.5% of FS Span |
| Storage temperature range | -40 to 212°F (-40 to 100°C) |
| Shock | 50g, 11msec half sine shock per MIL standard 202F, method 213B, condition A |
| Vibration | ±20g MIL-STD-810C, Procedure 514.2, Figure 514.2-2, curve L |
| EMI/RFI Immunity | EN 50081-2 EN 50082-2 (10V/M, 26-1000MHz) EN 61326 (Effective July 1, 2001) |

ORDERING



Electrical Connections:

| | | | |
|-----------------|------------|----------|---------|
| Outputs: | 3/4 | 5 | |
| Red | +Supply | Red | +Supply |
| Black | Ground | Black | Output |
| White | Output | | |



DIMENSIONS IN INCHES AND ARE REFERENCE ONLY.

UNITED STATES
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Email: sensors@msiusa.com
Web site: www.msiusa.com

P/N: 2001315 10/00

MSP-430 High Pressure EMI/RFI Protected Stainless Steel Isolated Pressure Transducer

- 100% Leak Proof
- Low Cost OEM

Features

One-piece Stainless Steel Construction
EMI/RFI Protection
Amplified Outputs
Excellent Accuracy
Wide Operating Temperature Range
Vibration, Shock and Thermal Resistance

**MSP-430
with automotive
connector.**



Applications

Diesel Injection
Hydraulic Systems
Off Road
Water Jetting
Test Stands
Downhole
Industrial Systems



Description

The MSP series pressure transducers set a new price-performance standard for low cost, high volume, commercial and industrial applications. This series is suitable for measurement of liquid or gas pressure, even for difficult media such as contaminated water, steam, and mildly corrosive fluids or gases.

The transducer pressure cavity is machined from a solid piece of 17-4 PH stainless steel. The standard version includes a M18 x 1.5mm pipe thread allowing a leak-proof, all metal sealed system. There are no o-rings, welds or organics exposed to the pressure media. The durability is excellent.

Measurement Specialties proprietary Microfused technology, derived from demanding aerospace applications, employs micromachined silicon piezoresistive strain gages, fused with high temperature glass to a stainless steel diaphragm. This approach achieves media compatibility simply and elegantly providing an exceptionally stable sensor without the p-n junctions of conventional micromachined sensors.

This product is geared to the OEM customer using medium to high volumes. The standard version is suitable for many applications, but the dedicated design team at our Transducer Engineering Center stands ready to provide a semi-custom design where the volume and application warrants.

- No Leaks
- No Welds
- No "O" Rings
- No Silicone Oil

SPECIFICATIONS

Performance at 77°F (25°C):

| | |
|---|--|
| Pressure range | 0 to 26000 PSI (1800 BAR) |
| Accuracy (combined linearity, hysteresis and repeatability) | ± .5% of FS (for higher accuracy consult factory) |
| Media compatibility | 17-4 PH stainless steel (for other material consult factory) |
| Pressure ports | M18x1.5mm (for custom ports consult factory) |
| Pressure cycles | >10 ⁸ full pressure cycles |
| Pressure overload | 37,500 PSI |
| Burst pressure | 55,000PSI |
| Long term stability (1 year) | ± 0.25% FS, typical |

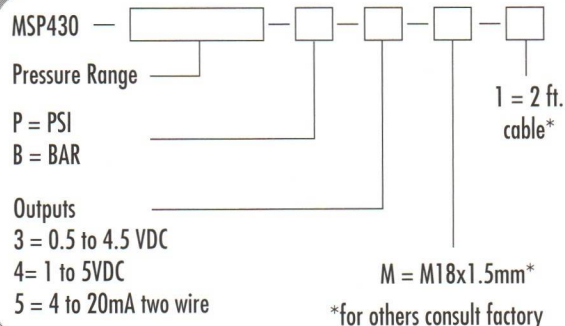
Electrical:

| | | |
|------------------|--|--|
| Supply voltage | 5VDC | 10-30VDC |
| Supply current | <10mA | <15mA |
| Outputs | 0.5 - 4.5VDC, ratiometric to supply (3) | 1-5VAC, fixed (4) 4-20mA two wire (5) |
| Interface | 2 ft PVC jacketed cable (for other options consult factory) | |
| Zero offset | ± 2% of FS Span (for tighter tolerances consult factory) | |
| Span tolerance | ± 2% of FS Span (for tighter tolerances consult factory) | |
| Output load | 5K Ohm (min) for high level voltage 0 Ohms @ 10V (1100 Ohms @ 32V) for 4-20mA | |
| Noise | < 2mVRMS | |
| Bandwidth (-3dB) | DC to 1KHz (Typical) | |

ENVIRONMENTAL

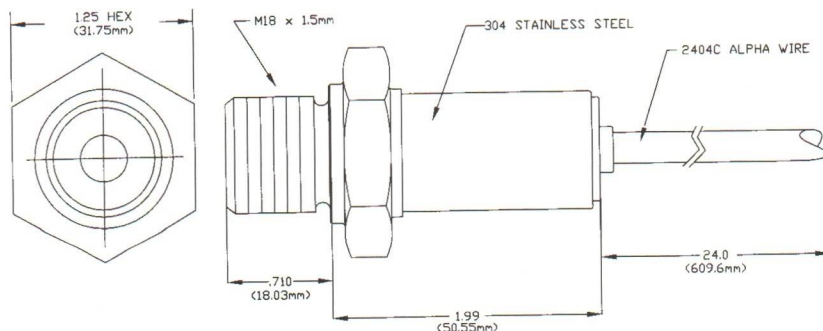
| | |
|-------------------------------|---|
| Operating temperature range | -40° to 185°F (-40 to 85°C), (For other temperature ranges consult factory) |
| Compensated temperature range | 30 to 158°F (0 to 70°C) |
| Zero thermal error | < ± 1.5% of FS Span |
| Span thermal error | < ± 1.5% of FS Span |
| Storage temperature range | -40 to 212°F (-40 to 100°C) |
| Shock | 50g, 11msec half sine shock per MIL standard 202F, method 213B, condition A |
| Vibration | ±20g MIL-STD-810C, Procedure 514.2, Figure 514.2-2, curve L |
| EMI/RFI Immunity | 100V/n, 150kHz to 230 MHz (EN61000-4-6) |

ORDERING



Electrical Connections:

| | | | |
|-----------------|------------|-------|----------|
| Outputs: | 3/4 | | 5 |
| Red | +Supply | Red | +Supply |
| Black | Ground | Black | Output |
| White | Output | | |



UNITED STATES
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M
MEASUREMENT
SPECIALTIES

MSP-600

New High Accuracy, Digitally Compensated EMI/RFI Protected Stainless Steel Isolated Pressure Transducer

ISO
9001

- High Accuracy
- Low Cost OEM
- 100% Leak Proof

Features

High Accuracy
Digitally Compensated
One-piece Stainless Steel Construction
Ranges up to 10,000 PSI or 700 BAR
Amplified Outputs
Wide Operating Temperature Range
Low Pressure Configuration

Applications

Pumps and Compressors
Hydraulic/Pneumatic Systems
Off Road/Mobile Equipment
Energy and Water Management
Pressure Instrumentation
Refrigeration Equipment
Agriculture Equipment
Train Braking Systems



Description

The MSP series pressure transducers set a new price-performance standard for low cost, high volume, commercial and industrial applications. This series is suitable for measurement of liquid or gas pressure, even for difficult media such as contaminated water, steam, and mildly corrosive fluids or gases.

The transducer pressure cavity is machined from a solid piece of 17-4 PH stainless steel. The standard version includes a 1/4" NPT pipe thread allowing a leak-proof, all metal sealed system. There are no "o"-rings, welds or organics exposed to the pressure media. The durability is excellent.

Measurement Specialties proprietary Microfused technology, derived from demanding aerospace applications, employs micromachined silicon piezoresistive strain gages, fused with high temperature glass to a stainless steel diaphragm. This approach achieves media compatibility simply and elegantly providing an exceptionally stable sensor without the p-n junctions of conventional micromachined sensors.

This product is geared to the OEM customer using medium to high volumes. The standard version is suitable for many applications, but the dedicated design team at our Transducer Engineering Center stands ready to provide a semi-custom design where the volume and application warrants.

- 1% Total Error Band
- No Leaks
- No Welds
- No "O" Rings
- No Silicone Oil

NEW
DIGITALLY
COMPENSATED
DESIGN

SPECIFICATIONS

Performance at 25°C (77°F):

| | |
|--|---|
| Pressure range | 0-25, 50, 75, 100, 250, 500, 1000, 2500, 5000, 7500, 10000 PSI (0-3, 6, 7, 17, 35, 70, 175, 350, 525, 700 BAR) |
| Accuracy, % of FS Span (combined linearity, hysteresis and repeatability) | ± 0.25% BSL, max (per ISA S37.2) |
| Media compatibility | 17-4 PH stainless steel (optional 316L stainless) |
| Pressure cycles | 10 million, minimum |
| Pressure overload | 2 times rated pressure |
| Burst pressure | 4 times full scale or 20,000 PSI, whichever is less |
| Long term stability (1 year) | ± 0.25% FS Span (Typical) |

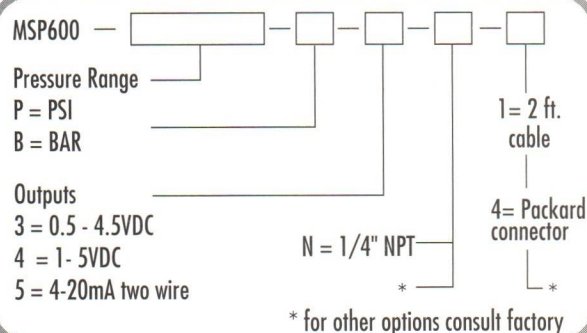
Electrical:

| | Ratiometric | Non-Ratiometric |
|----------------------------|--|--|
| Supply voltage | 4.75 to 5.25VDC | 10 - 30VDC |
| Supply current | <10mA | <25mA |
| Output | 0.5 to 4.5V, at 5V (3) | 1 - 5V, three wires (4) 4 - 20mA, two wires (5) |
| Load impedance | > 100k Ohms for quoted performance for 4 - 20mA; 0.05(Vsupply-10)k Ohms (maximum) | |
| Bandwidth | DC to 1KHz (Typical) | |
| Standard connector options | Packard connector - Metri-pack 150, 3 pins Cable - 24" length (Additional connectors available upon request) | |

ENVIRONMENTAL

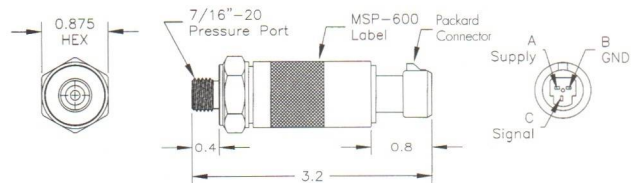
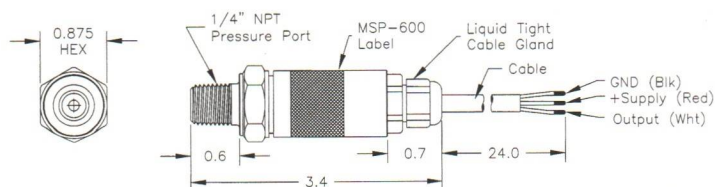
| | |
|--|---|
| Operating temperature range | -40° to 100°C (125°C available, consult factory) |
| Compensated temperature range | -20° to 85°C (125°C available, consult factory) |
| Total error band (over compensated temperature range) | < ± 1% of FS (75-10,000 PSI) < ± 1.5% of FS (25-50 PSI) |
| Storage temperature range | -45° to 100°C |
| Shock | 50g, 11msec half sine shock per MIL standard 202F, method 213B, condition A |
| Vibration | ±20g MIL-STD-810C, Procedure 514.2, Figure 514.2-2, curve L |
| EMI/RFI Immunity | EN 50081-2 EN 50082-2 (10V/M, 26-1000MHz) EN 61326 (Effective July 1, 2001) |
| Humidity | 95% RH, condensing |

ORDERING



Electrical Connections:

| Outputs: | 3/4 | 5 |
|----------|---------|--------------|
| Red | +Supply | Red +Supply |
| Black | Ground | Black Output |
| White | Output | |



Dimensions In Inches And Are Reference Only

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M
MEASUREMENT
SPECIALTIES

Glossary

LVDT Terminology

Ambient Conditions

The conditions (pressure, temperature, etc.) of the medium surrounding the case of the transducer.

Analog Output

Transducer output which is a continuous function of the measurand, except as modified by the resolution of the transducer.

Best Straight Line

A line midway between the two parallel straight lines closest together and enclosing all output vs. measurand values on a calibration curve.

Calibration

A test during which known values of measurand are applied to the transducer and corresponding output reading are recorded under specified conditions.

Calibration Curve

A graphical representation of the calibration record.

Calibration Cycle

The application of known values of measurand, and recording of corresponding output readings, over the full (or specified portion of the) range of a transducer in an ascending and descending direction.

Calibration Record

A record (e.g., table or graph) of the measured relationship of the transducer output to the applied measurand over the transducer range. Calibration records may contain additional calculated points so identified.

Calibration Traceability

The relation of a transducer calibration, through a specified step-by-step process, to an instrument or group of instruments calibrated by the N.I.S.T.

Calibration Uncertainty

The maximum calculated error in the output values, shown in a calibration record, due to causes not attributable to the transducer.

Compensation

Provision of a supplemental device, circuit, or special materials to counteract known sources of error.

Digital Output

Transducer output that represents the magnitude of the measurand in the form of a series of discrete quantities coded in a system of notation. Distinguished from analog output.

Drift

An undesired change in output over a period of time, which change is not a function of the measurand.

Dynamic Characteristics

Characteristics of a transducer which relate to its response to variations of the measurand with time.

End Points

The outputs at the specified upper and lower limits of the range. Unless otherwise specified, end points are averaged during any one calibration.

Environmental Conditions

Specified external conditions (shock, vibration, temperature, etc.) to which a transducer may be exposed during shipping, storage, handling, and operation.

Environmental Conditions, Operating

Environmental conditions during exposure to which a transducer must perform in some specified manner.

Error

The algebraic difference between the indicated value and the true value of the measurand. It is usually expressed in percent of the full-scale output, sometimes expressed in percent of the output reading of the transducer. A theoretical value may be specified as true value.

Error Band

The band of maximum deviations of output values from a specified reference line or curve due to those causes attributable to the transducer. The band of allowable deviations is usually expressed as " \pm __ percent of full-scale output," whereas in test and calibration reports, the band of maximum actual deviations is expressed as "+__ percent, -__ percent of full-scale output." The error band should be specified as applicable over at least two calibration cycles, so as to include repeatability, and verified accordingly.

Error Curve

A graphical representation of errors obtained from a specified number of calibration cycles.

Excitation

The external electrical voltage and/or current applied to a transducer for its proper operation. In the sense of a physical quantity to be measured by a transducer, use measurand. Usually expressed as range(s) of voltage and/or current values. Also see Maximum Excitation.

LVDT Terminology

Frequency Response

The change with frequency of the output measurand amplitude ratio (and of the phase difference between output and measurand), for a sinusoidally varying measurand applied to a transducer within a stated range of measurand frequencies. It is usually specified as “within \pm __ percent (or \pm __ db) from __ to __ Hz.” Frequency response should be referred to a frequency within the specified measurand frequency range and to a specific measurand value.

Full Scale (see range)

Hysteresis

The maximum difference in output, at any measurand value within the specified range, when the value is approached first with increasing and then with decreasing measurand. Hysteresis is expressed in percent of full-scale output, during any one calibration cycle. Friction error is included with hysteresis unless dithering is specified.

Input Impedance

The impedance (presented to the excitation source) measured across the excitation terminals of a transducer. Unless otherwise specified, input impedance is measured at room conditions, with no measurand applied, and with the output terminals open circuited.

Least-Squares Line

The straight line for which the sum of the squares of the residuals (deviations) is minimized.

Least-Square Linearity (see Linearity, Least Squares) Linearity

The closeness of a calibration curve to a specified straight line. Linearity is expressed as the maximum deviation of any calibration point on a specified straight line, during any one calibration cycle. It is expressed as “within \pm percent of full range output.”

Linearity, End Point

Linearity referred to the end-point line.

Linearity, Independent

Linearity referred to the Best Straight Line.

Linearity, Least Squares

Linearity referred to the least-squares line.

Linearity, Terminal

Linearity referred to the Terminal line.

Load Impedance

The impedance presented to the output terminals of a Transducer by the associated external circuitry.

Maximum (Minimum) Ambient Temperature

The value of the highest (lowest) ambient temperature to which a transducer can be exposed, with or without excitation applied, without being damaged or subsequently showing a performance degradation beyond specified tolerances.

Maximum Excitation

The maximum value of excitation voltage or current that can be applied to the transducer at room conditions without causing damage or performance degradation beyond specified tolerances.

Mean Output Curve

The curve through the mean values of output during any one calibration cycle or a different specified number of calibration cycles.

Measurand

A physical quantity, property or condition which is measured. The term measurand is preferred to “input,” “parameter to be measured,” “physical phenomenon,” “stimulus,” and “variable.”

Output

The electrical quantity, produced by a transducer, which is a function of the applied measurand.

Output Impedance

The impedance across the output terminals of a transducer presented by the transducer to the associated external circuitry.

Output Noise

The rms, peak, or peak-to-peak (as specified) AC component of a transducer's DC output in the absence of measurand variations. Unless otherwise specified, output impedance is measured at room conditions and with the excitation terminals open circuited, except that nominal excitation and measurand between 80 and 100 percent of span is applied when the transducer contains integral active output-conditioning circuitry.

Output Regulation

The change in output due to a change in excitation. Unless otherwise specified, output regulation is measured at room conditions and with the measurand applied at its upper range limit.

Overload

The maximum magnitude of measurand that can be applied to a transducer without causing a change in performance beyond specified tolerance.

Overrange (see Overload)

Precision (see Repeatability and Stability) Range

The measurand values, over which a transducer is intended to measure, specified by their upper and lower limits.

Repeatability

The ability of a transducer to reproduce output readings when the same measurand value is applied to it consecutively, under the same conditions, and in the same direction. Repeatability is expressed as the maximum difference between output readings; it is expressed as “within __ percent of full-scale output.” Two calibration cycles are used to determine repeatability unless otherwise specified.

Glossary

LVDT Terminology

Resolution

The magnitude of output step changes as the measurand is continuously varied over the range. Resolution is best specified as average and maximum resolution; it is usually expressed in percent of full-scale output. In the sense of the smallest detectable change in measurand, use threshold.

Room Conditions

Ambient environmental conditions, under which transducers must commonly operate, which have been established as follows:

- a) temperature: $25 \pm 10^{\circ}\text{C}$ ($77 \pm 18^{\circ}\text{F}$)
- b) relative humidity: 90% or less.
- c) barometric pressure: 26" to 32" of mercury.

Tolerances closer than shown are frequently specified for transducer calibration and test environments.

Sensing Element

That part of the transducer which responds directly to the measurand. This term is preferred to "primary detecting element."

Sensitivity

The ratio of the change in transducer output to a change in the value of the measurand. In the sense of the smallest detectable change in measurand, use threshold.

Sensitivity Shift

A change in the slope of the calibration curve due to a change in sensitivity.

Source Impedance

The impedance of the excitation supply presented to the excitation terminals of the transducer.

Span

The algebraic difference between the limits of the range.

Stability

The ability of a transducer to retain its performance characteristics for a relatively long period of time. Unless otherwise stated, stability is the ability of a transducer to reproduce output readings obtained during its original calibration, at room conditions, for a specified period of time; it is then typically expressed as "within _____ percent of full-scale output for a period of _____ months."

Temperature Error Band

The error band applicable over stated environmental temperature limits.

Temperature Gradient Error

The transient deviation in output of a transducer at a given measurand value when the ambient temperature or the measured fluid temperature changes at a specified rate between specified magnitudes.

Temperature Range, Operating

The range of ambient temperatures, given by their extremes, within which the transducer is intended to operate. Within this range of ambient temperature, all tolerances specified for temperature error, temperature error band, temperature gradient error, thermal zero shift and thermal sensitivity shift are applicable.

Terminal Line

A Theoretical slope for which the theoretical end points are 0 and 100% of both measurand and output.

Theoretical Curve

The specified relationship (table, graph, or equation) of the transducer output to the applied measurand over the range.

Thermal Sensitivity Shift

The sensitivity shift due to changes of the ambient temperature from room temperature to the specified limits of the operating temperature range.

Thermal Zero Shift

The zero shift due to changes of the ambient temperature from room temperature to the specified limits of the operating temperature range.

Threshold

The smallest change in the measurand that will result in a measurable change in transducer output. When the threshold is influenced by the measurand values, these values must be specified.

Transducer

A device which provides a usable output in response to a specified measurand. The term transducer is usually preferred to "sensor".

Warm-up Period

The period of time, starting with the application of excitation to the transducer, required to assure that the transducer will perform within all specified tolerances.

Zero-Measurand Output

The output of a transducer, under room conditions unless otherwise specified, with nominal excitation and zero measurand applied.

Zero Shift

A change in the zero-measurand output over a specified period of time and at room conditions. This error is characterized by a parallel displacement of the entire calibration curve.

Gage Head Terminology

Excitation Voltage

The signal required to operate an AC-operated gage head is typically between 1 and 5 VAC rms, at 400 Hz to 10 kHz, depending on LVDT design. DC-operated gage heads, require ± 15 VDC at 25mA. (GCD-SE requires 8.5-28 V at <10 mA.)

Full Scale Displacement

The linear travel of a transducer, expressed as a \pm number, such as ± 0.020 " or ± 0.3 mm. This is the maximum \pm range over which the transducer has been designed to operate and still meet stated catalog specifications. Full scale displacement is always measured from the zero position.

Full Scale Output

The maximum \pm voltage of a transducer at its maximum linear measuring range, for a given excitation voltage. This would be calculated as follows: sensitivity times excitation, in volts times \pm gaging range in 0.001" or millimeters.

Gage Head

A mechanically fixtured linear transducer, usually an LVDT or half-bridge device, designed to provide a repeatable electrical output in linear proportion to plunger movement.

Linearity

The closeness of the calibration curve to a specified straight line. Linearity is expressed as the maximum dimensional deviation of any calibration point from a specified straight line during a calibration cycle. This deviation is expressed as within a % of full scale displacement.

Mechanical Travel

The pretravel, plus the total gaging range, plus the overtravel.

Overtravel

The remaining mechanical travel of a transducer, in the positive or compressed direction, after displacing the plunger to the maximum positive linear position, from the zero position.

Pretravel

The difference between the fully extended position of the gage head plunger, and the zero position, after subtracting the full scale displacement of the transducer.

Repeatability

The ability of a transducer to return the same output value under repeated identical mechanical positioning, from any direction, under identical environmental conditions. This may be expressed as an absolute value such as micro inches or micrometers.

Resolution

The absolute minimum mechanical input that will result in a detectable change of output voltage. For all intents and purposes, the resolution of an LVDT is considered to be infinite, limited only by the ability of the signal conditioner to detect the change. The resolution of a gage head is limited to the mechanical repeatability of the bearing system.

Sensitivity

The ratio of change in transducer output to a change in plunger displacement. Sensitivity is usually expressed in units of mV/V/.001" or mV/V/mm of displacement, with "V" being excitation voltage.

Total Gaging Range

Two times the \pm full scale displacement of the transducer.

Zero (null)

A position within the linear range of the transducer that results in a condition of balance, yielding a minimum absolute value of output.

Glossary

Rotary Sensor Terminology

Full Range

The limit of shaft rotation (in degrees) in which the sensor will register an output which is linear within the published specifications.

Input Voltage

The voltage required to operate the device, expressed as Volts DC (V_{in} DC), or Volts AC (V_{rms}).

Input Current

The maximum amount of current the sensor will draw on the input voltage line, expressed as amps DC (A DC).

Input Frequency

The frequency of the AC input voltage, expressed as kHz.

Sensitivity/Scale Factor

The amount of change in output voltage for a given amount of shaft rotation, typically expressed as volts or milliamps out, per degree (for DC operated units), or millivolts out, per Volt in, per degree (for AC operated units).

Output Voltage

The nominal voltage output reading when shaft is rotated to full range, expressed in volts DC (V_o DC).

Output Current

The maximum amount of current the sensor can supply across the output signal, expressed as amps DC (A DC).

Impedance

The AC resistance across the output or input of the sensor, expressed in ohms.

Primary DCR (RVDT's)

The DC resistance across the input voltage lines (primary), expressed in ohms.

Secondary DCR (RVDT's)

The DC resistance across the output signal lines (secondary), expressed in ohms.

Linearity

This specification dictates the amount a sensors output may deviate from a theoretical straight line, expressed as a % of full scale output.

Frequency Response (-3db point)

The oscillating frequency where the output is 71% of the input shaft rotation, expressed in Hertz (Hz).

Temperature Coefficient of Null

The amount of offset the output could change due to temperature changes, when sensor is at its null (zero) position.

Temperature Coefficient of Scale

The amount the slope (scale factor) could change due to temperature changes.

Operating Temperature Range

The extreme high and low temperatures in which the device can be operated, and perform within its specifications.

Storage Temperature Range

The extreme high and low temperatures in which the device can be stored without damage occurring.

Tilt Sensor Terminology

Cross Axis Error

This is how much the output could be effected if the sensor is titled in an axis perpendicular to its sensitive axis.

Current

This tell us how many amperes the device could draw from the supply. It could be important in choosing the correct supply.

Frequency Response

This is a rating of how well the sensor will react to a sinusoidal (rocking) input.

Linear Range

The limit of tilt in which the sensor will register an output which is linear within the published specifications.

Linearity

This specification outlines a window in which the sensor could deviate from an ideal linear output.

Load Resistance

This is the minimum amount of resistance, in ohms, which is required across the output to operate the sensor. If there is less than this amount, the circuit can not supply enough current to keep the voltage at the specified value. A larger resistance is fine.

Null Repeatability

This is how much deviation could take place if a sensor is moved from a given point and returned to the same point.

Operating Temperature Range

The extreme high and low temperatures in which the device can be operated.

Performance

The performance specifications for any sensor typically list everything but "accuracy". This is because there are many elements which go into the overall accuracy of the unit. Let's look at a definition for each specification.

Scale Factor

This is the slope of the output (in millivolts per degree or usec per degree). In other words, how much the output will change as the device is tilted.

Storage Temperature Range

The extreme high and low temperatures in which the device can be stored without damage occurring.

Temperature Coefficient of Null

The amount of offset the output could change due to temperature changes, when sensor is at its null (zero) position.

Temperature Coefficient of Scale

The amount the slope (scale factor) could change due to temperature changes.

Threshold/Resolutions

The amount of tilt needed to register a change in the output. This specification has no bearing on linearity, repeatability or overall accuracy.

Time Constant

This is a rating of how fast the sensor output will react to a step input movement.

Total Range

The limit of tilt at which the sensor will register an output change.

Voltage Supply

The nominal supply voltage is the voltage at which the device was designed and tested. The range is the high and low voltage at which the device can be operated.

Glossary

Pressure Sensor Terminology

Accuracy (Static Error Band)

The combined effect of nonlinearity, hysteresis, and non-repeatability, expressed as a percentage of full range output.

Best Straight Line

A line midway between two parallel straight lines enclosing all output values versus pressure values on a calibration curve.

Burst Pressure Rating

The maximum pressure that can be applied to the pressure diaphragm without failure.

Compensated Temperature Range

The range of temperature over which the thermal errors of the transducer have been compensated and to which specified values of thermal zero shift, thermal sensitivity shift, thermal zero repeatability, and thermal sensitivity repeatability apply.

Electrical Excitation

The input voltage applicable to the transducer calibration applies.

Full Range Output

The span of electrical output between the maximum positive and the maximum negative end points of the calibration curve.

(i.e. For a differential pressure transducer with a range of 10 psi and an output of 5 V, the "Full Range Output" is 20 psi if the unit is calibrated in a bi-directional (BD) mode. The transducer is calibrated to measure from -10 psi to +10 psi. The output in this example is then -5 V to +5 V. The Full Scale Output or Span is 5 V. If the unit is calibrated in a uni-directional (UD) mode, the Full Range Output is equal to the Full Scale Output which is equal to 0 to 10 psi. The output will then be 0 to 5 V.)

Full Scale Output

The span of electrical output between zero output and the rated output.

Hysteresis

The maximum difference in output, at any pressure value within the specified range, when the pressure value is approached first with increasing and then decreasing pressure. Expressed as a percentage of full range output.

Maximum Electrical Excitation

The maximum input voltage which may be applied without damage to the transducer.

Nonlinearity

The maximum deviation of any calibration point on a specified straight line during a full calibration cycle. The deviation is expressed as a percentage of full range output.

Nonlinearity and Hysteresis

The maximum deviation of any calibration point obtained by either increasing or decreasing input, from a specified straight line drawn through all calibration points and making the deviation a minimum. Nonlinearity is expressed as a percentage of full range output.

Operational Temperature Range

The range of temperature over which the transducer may be used without damage.

Pressure Limit or Proof Pressure (Overpressure)

The maximum allowable pressure difference between the rated pressure and the over pressure, without affecting in subsequent operation, the performance requirements over the rated pressure range.

Pressure Range (Rated Pressure)

The algebraic difference between the maximum pressure and the minimum pressure over which the transducer is calibrated.

Pressure Reference (Operational Pressure Mode)

The reference pressure against which the input pressure is measured in:

Vented Gauge: ambient atmospheric pressure.

Sealed Gauge: internal sealed atmospheric reference pressure.

Absolute: internal sealed vacuum.

Differential Gauge: difference of two (unknown) pressures.

Residual Unbalance or Zero Balance

The electrical output at the rated electrical excitation at zero pressure applied at room temperature.

Secondary Containment

The maximum pressure which may be contained in the event of a diaphragm failure without loss of pressure seal of the transducer case. Only available in subsea and special transducers.

Sensitivity

The output per unit at rated excitation and room temperature.

Span

The span of electrical output between the calibrated zero output and the calibrated maximum output.

Thermal Hysteresis

The difference in zero output, after the transducer has been subjected to higher or lower temperature than in its normal application.

Thermal Sensitivity Coefficient

The difference between the electrical output at temperature T_1 and temperature T_2 with full range applied pressure, as expressed by % F.R.O./°C or % F.R.O./°F.

Thermal Zero Coefficient

The difference between the electrical output at temperature T_1 and temperature T_2 with zero applied pressure, as expressed by % F.R.O./°C or % F.R.O./°F.

Total Thermal Error

The maximum sensitivity and zero error, caused by temperature, within the compensated temperature range.

Zero Thermal Error

The maximum zero error, caused by temperature, within the compensated temperature range.

Terms and Conditions

Schaevitz® Sensors Division

Measurement Specialties Incorporated

1. Quotations and Acceptance:
 - (a) Quotations are valid for a period of sixty (60) days from date of quotation, and represent no obligation until Schaevitz® Sensors; Division of Measurement Specialties, Inc. (hereafter Schaevitz® Sensors) accepts the written Purchase order.
 - (b) In the event of inconsistency between Schaevitz® Sensors and the Purchaser's conditions, Schaevitz® Sensors shall prevail. No variation of Schaevitz® Sensors' conditions shall be binding upon Schaevitz® Sensors unless and until the variation has been accepted in writing by a duly authorized person on behalf of Schaevitz® Sensors.
2. Price and Delivery:
 - (a) Unless otherwise agreed, Delivery will be F.O.B. Hampton facility, Hampton, VA, and goods will be packed to normal specification in non-returnable packaging. Transportation will be arranged at the request and at the expense of the Purchaser. Where applicable, COD charges will be added to the price of the goods.
 - (b) Any delivery period quoted is an estimate only and commences from Schaevitz® Sensors acknowledgment of the Purchaser's order. The sole remedy of Purchaser for failure of Schaevitz® Sensors to deliver in a timely manner shall be for Purchaser to acquire the goods from another source, in which case said quantity shall be eliminated from this contract, and Purchaser shall have no claim against Schaevitz® Sensors for damages.
 - (c) Schaevitz® Sensors reserves the right to deliver in more than one lot and to invoice each lot separately.
 - (d) Shortages, defective or damaged goods must be reported to Schaevitz® Sensors within thirty (30) days of Delivery. All goods are shipped at Purchaser's risk and claims for goods damaged or lost in transit should be filed by the consignee direct with the transportation company.
 - (e) All returned materials must have a Returned Materials Authorization (RMA) number issued by Schaevitz® Sensors. This authorization is valid for a period of 30 days. Returns at the customer convenience are limited to standard, catalog items, and are subject to a \$100 or 15% restocking fee, whichever is greater, excluding freight charges. Returned materials for Quality Complaints will be evaluated by the quality department and a credit issued when the complaint is approved. Customer specific products may not be returned except for Quality Complaints or Schaevitz® Sensors error.
 - (f) For all Customer Specific Products, Schaevitz® Sensors reserves the right for a shipping tolerance of ≤5% for each shipment and for the total order. Cancellation charges and/or inventory carrying costs may be imposed for products when orders are canceled or modified within eight weeks of the scheduled ship date.
3. Title and Risk of Loss:
 - (a) Title will pass to the Purchaser only on receipt by Schaevitz® Sensors of payment for the full invoice price of the goods.
 - (b) Risk of loss shall pass to the Purchaser on leaving Schaevitz® Sensors premises.
4. Payment:
 - (a) Payment shall be due 30 days from date of invoice, subject to credit approval, except where Schaevitz® Sensors stipulates CWO or COD terms. Payment shall not be withheld on account of any claim by the Purchaser against Schaevitz® Sensors. Schaevitz® Sensors reserves the right to charge interest at 1.5% per month on any sum outstanding after the due date.
 - (b) Schaevitz® Sensors reserves the right, among other remedies, either to cancel this contract or to suspend further deliveries under it in the event Buyer fails to pay for any one shipment when payment becomes due. Should Buyer's financial responsibility become unsatisfactory to Schaevitz® Sensors, cash payments or satisfactory security may be required by Schaevitz® Sensors.
 - (c) Any tax, duty, custom, or other fee of any nature imposed upon this transaction by any federal, state, or local government authority shall be paid by the Purchaser, in addition to the price quoted or invoiced. In the event Schaevitz® Sensors is required to prepay any such tax, Purchaser will reimburse Schaevitz® Sensors.
 - (d) Unless specifically otherwise stated, all payments are to be made in United States Dollars (\$), with the payment check drawn on a US Bank. All banking charges, if any, are to be pre-paid by the Purchaser.
5. Technical Assistance and Data: Schaevitz® Sensors may, at Purchaser's request, furnish technical assistance, advice and information with respect to the goods supplied under this Contract, if and to the extent that such assistance, advice and information is readily available, except for proprietary techniques or procedures. It is expressly agreed that there is no obligation to provide such information, and that the information is subject to the limitation of liability in paragraph 10 below. Schaevitz® Sensors accepts no liability in contract, tort or otherwise for any damages or injury arising directly or indirectly from any error or omission in such technical data or literature.
6. Warranty:
 - (a) Schaevitz® Sensors warrants title to the product sold hereunder and that for a period of 1 year from Delivery it conforms to Schaevitz® Sensors specifications and is free from defects in material and workmanship. If the product fails to meet said warranties, Schaevitz® Sensors shall replace/repair the non-conforming product at no cost to Buyer. The foregoing is Buyer's sole and exclusive remedy for failure of Schaevitz® Sensors to deliver or supply product that meets the foregoing warranties. Schaevitz® Sensors MAKES NO OTHER WARRANTY OF ANY KIND EXPRESS OR IMPLIED INCLUDING ANY WARRANTY OF MERCHANTABILITY, FITNESS OF THE PRODUCT FOR ANY PARTICULAR PURPOSE EVEN IF THAT PURPOSE IS KNOWN TO Schaevitz® Sensors, OR ANY WARRANTY RELATING TO PATENTS, TRADEMARKS, COPYRIGHTS OR OTHER INTELLECTUAL PROPERTY.
 - (b) Purchaser warrants that the designs and specifications furnished by it to Schaevitz® Sensors will not infringe any patent, trademark or copyright with respect to the manufacture and sale of the resulting products. (continued next page)

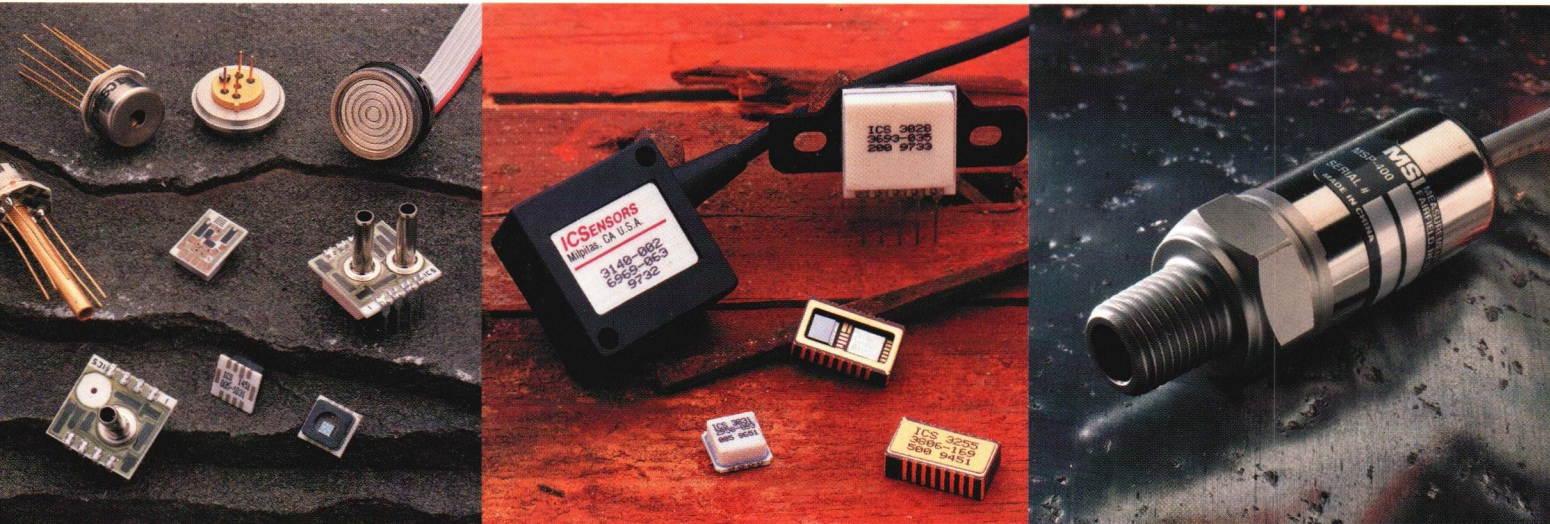
Terms and Conditions

Measurement Specialties Incorporated

7. Tools: Tools made for the manufacture of goods to be supplied under the contract and the copyright therein remain Schaevitz® Sensors property notwithstanding that the Purchaser may have been debited with any sum in respect of their cost.
8. Excusable Delays: No liability shall result from delay in performance or non-performance in whole or in part if performance as agreed has been made impracticable by compliance in good faith with any applicable foreign or domestic governmental regulation or order whether or not it later proves to be invalid, or by the occurrence of a contingency the non-occurrence of which was a basic assumption on which this contract was made, including, but not limited to, acts of God, fire, flood, accident, riot, war, sabotage, strike, labor trouble or shortage, or embargo. Schaevitz® Sensors inability to obtain at prices and on terms deemed by it to be practicable any required raw material, energy source, equipment, labor, or transportation, or any increased costs due to capital improvements for environmental protection shall also be sufficient to relieve Schaevitz® Sensors of its obligation to perform hereunder. If any of such circumstances affect only a part of Schaevitz® Sensors capacity to perform, Schaevitz® Sensors shall have the right to allocate production and deliveries among all of its customers and its own requirements in a manner and at such times as Schaevitz® Sensors may determine. Quantities affected by this paragraph may, at the option of either party, be eliminated from the contract without liability, but the contract shall remain otherwise unaffected.
9. Indemnification: Buyer agrees to indemnify, defend and hold Schaevitz® Sensors harmless from and against that portion of any liability, cost, expense (including reasonable attorneys' fees), claim, judgment, settlement or damage that Schaevitz® Sensors may be required to pay to any third party (including, but not limited to, any employee of Buyer who alleges or proves that he or she has been injured in the course of his or her employment while working with the products supplied by the Schaevitz® Sensors under this agreement), which: i) is caused or contributed to by the negligence or fault of Buyer; or ii) results from the infringement of any patent, trademark or copyright related to the products (or designs and specifications therefor) supplied to Buyer hereunder. In case the Buyer resells the products supplied by the Schaevitz® Sensors under this agreement, Buyer will request and if possible obtain from its purchaser an indemnification similar to the foregoing for the benefit of Buyer and Schaevitz® Sensors.
10. Limitation of Liability: Schaevitz® Sensors shall not be liable on contract, tort or otherwise for any loss or damage suffered by the Purchaser whatsoever or howsoever arising out of or in connection with the supply of goods or services by Schaevitz® Sensors other than to supply goods conforming to the original agreed specifications or at Schaevitz® Sensors option to refund to the Purchaser any monies already paid in respect of the goods. Schaevitz® Sensors liability with respect to this contract and the products purchased under it shall not exceed the purchase price of the portion of such product as to which liability arises and Schaevitz® Sensors shall not be liable for any injury, loss or damage, resulting from the handling or use of the product shipped hereunder whether in manufacturing process or otherwise. In no event shall Schaevitz® Sensors be liable for special, incidental or consequential damages, including, but not limited to, loss of profits, capital or business opportunity; downtime costs; or claims of customers of Buyer. Failure to give Schaevitz® Sensors notice of any claim within 30 days of Delivery of the product concerned shall constitute a waiver of such claim by Buyer. Notwithstanding any applicable statute of limitations to the contrary, any action by Buyer relating to a claim hereunder must be instituted no later than two (2) years after the occurrence of the event upon which the claim is based. All of the foregoing limitations shall apply irrespective of whether Buyer's claim is based upon breach of contract, breach of warranty, negligence, strict liability, or any other legal theory.
11. Termination: If the Purchaser commits any breach of the terms and conditions of the contract or suffers distress or execution or becomes insolvent or commits an act of bankruptcy or enters into any arrangement or composition with his creditors or goes or is put into liquidation (other than solely for amalgamation or reconstruction while solvent) or if a receiver is appointed over any part of the Purchaser's business, Schaevitz® Sensors may without prejudice to any rights which may have accrued or which may accrue to it terminate the contract summarily by notice in writing.
12. Entire Agreement: This agreement constitutes the entire contract of sale and purchase of the product herein named. It is not assignable by Buyer without the written consent of Schaevitz® Sensors. No modification of this contract shall be of any force or effect unless in writing signed by the parties and no modification shall be effected by the acknowledgment or acceptance of purchase order forms containing different terms or conditions.
13. Governing Law: This contract shall be governed by and construed in accordance with the laws of the Commonwealth of Pennsylvania. Any lawsuit brought by Buyer arising out of the transactions covered hereunder shall be instituted in the appropriate state or federal court located in Philadelphia County, Pennsylvania, and Buyer further submits itself to the jurisdiction of said courts in the event Schaevitz® Sensors elects to institute any action in said courts.

Measurement Specialties, Inc.

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Measurement Specialties, Inc. (MSI), is well-known internationally for the development of new applications for cutting-edge sensor technologies. MSI products are based on a range of sensing technologies, including micromachining (3-D silicon sculpting, or MEMS), force balance, strain gage, capacitive, inductive, piezoresistive micromachined, and piezopolymer film. Micromechanical transducers and application specific integrated circuits (ASICs) are used where appropriate throughout the MSI line of sensing products, offering the most current core technologies at the lowest possible price.

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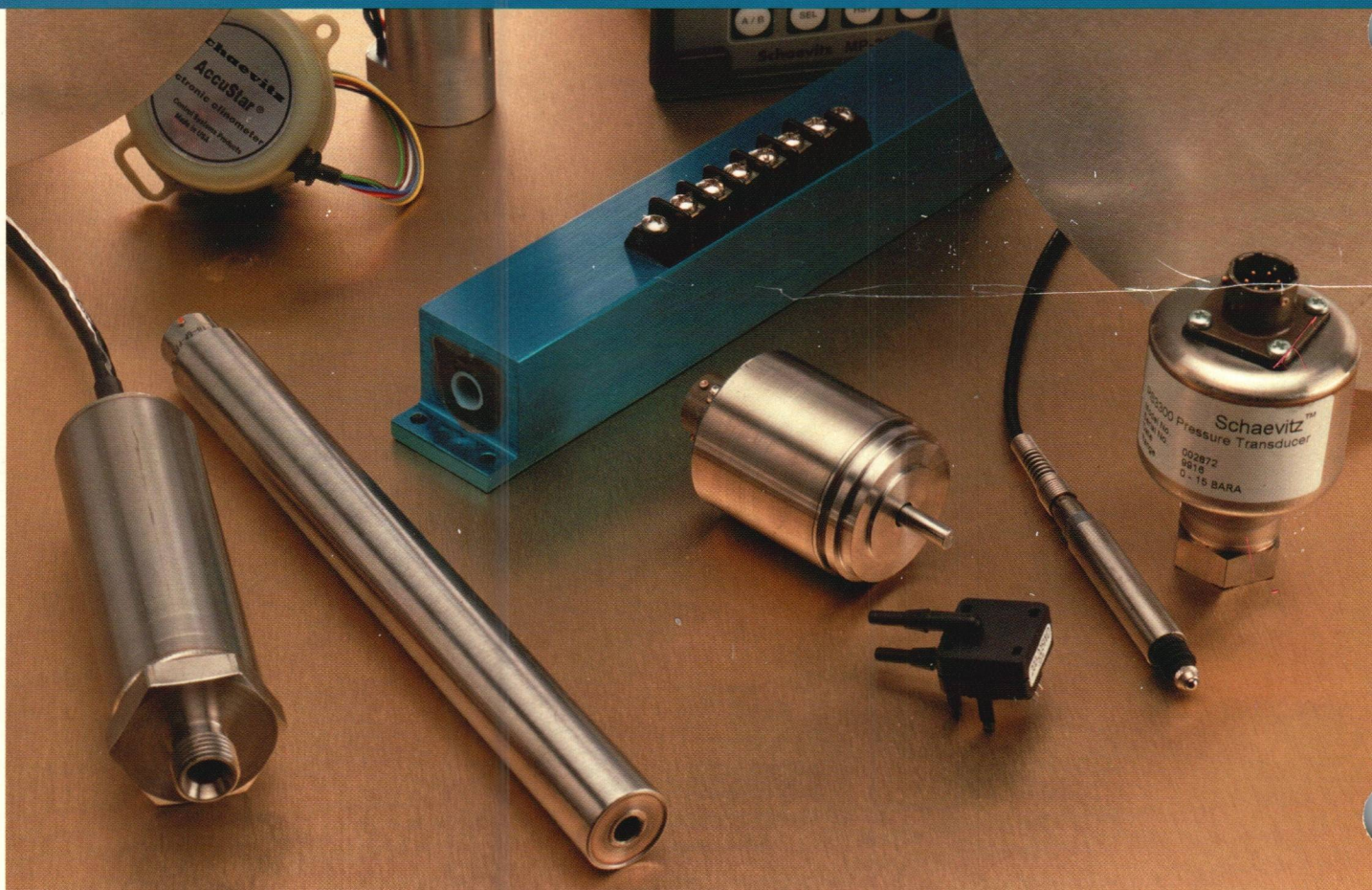
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